THE WORLD'S LARGEST FOSSIL FOREST P. 14 • SLEEPING DOGS AND PIGS IN POKES P. 92

Smithsonian

SPECIAL ISSUE

JULY 2009

SMITHSONIAN.COM

EXPLORING THE FRONTIERS OF SCIENCE

FEATURING

ENERGY FROM THE SEA

ROBOT BABIES

ASTONISHING NEW GENES

Plus

KHRUSHCHEV TAKES TINSELTOWN

MOONWALK LAUNCH PARTY

CHINESE SOLDIERS INVADE U.S.

Email elegance.

Equipped with mobile web and email, the new
Nokia E71x empowers you to effortlessly manage both work and play.
So you simply get more out of life.

Designed for the way we live

nokiausa.com/E71x

NOKIA
Connecting People

The Super Slim Nokia E71x

Now get the new Nokia E71x available exclusively from AT&T at&t

© 2009 Nokia. All rights reserved. Nokia, Nokia Connecting People and E71x are trademarks or registered trademarks of Nokia Corporation. Other company and product names may be trademarks or trade names of their respective owners. Wireless service is required to use many features. Some networks have limitations that affect how you can use this device. Contact your service provider about feature support and availability.

The times, they are A-Cha-Chinging.

This is the year to take advantage of great deals on vacations.

2008

Back in 2008, a four-star flight+hotel vacation to Hawaii cost quite the large handful of change — $1,545 on average.

Back in 2008, the price of a Las Vegas four-star flight+hotel vacation wasn't something to shake a stick at — $767 on average.

travelocity guarantee

Back in 2008, the Travelocity Guarantee always had your back, making sure your hotel with an open pool, did indeed have an open pool. If it didn't, we made it right, right away.

travelocity®
You'll never roam alone.®

My goodness, I was handsome in 2008!

2009

These days, you can get the same Hawaii four-star flight+hotel vacation for only $730 on average. Cha-ching is right!

Today, you can get that same Las Vegas four-star flight+hotel vacation for only $373 on average. So long, high price!

★ PRICE ★ GUARDIAN
1 Book Your Vacation
2 Price Drops
3 Get Automatic Refund

+ travelocity guarantee

*Now you can book your trip today, without worrying about a lower price tomorrow, thanks to PriceGuardian – a tool that automatically refunds you the difference if the same Travelocity vacation is booked at a lower price.**

travelocity®
You'll never roam alone.®

I'm an even handsomer chap in 2009!

2008 price is the average price of all Flight + Hotel vacation packages booked to Honolulu, Hawaii and Las Vegas on Travelocity during a one-week period in April 2008. 2009 price is the average price of all Flight + Hotel vacation packages booked to Honolulu, Hawaii and Las Vegas on Travelocity during the same one-week period in April 2009. See travelocity.com/guarantee for details on The Travelocity Guarantee. *Important restrictions apply. Refunds of $10 to $500 if the exact same Flight + Hotel vacation is booked on Travelocity. See www.travelocity.com/priceguardian for details. ©2009 Travelocity.com LP. All rights reserved. TRAVELOCITY, the Stars Design and The Roaming Gnome are trademarks of Travelocity.com LP. CST #2056372-50.

No camera will store as much as your heart.

Tortuguero National Park

COSTA RICA
No Artificial Ingredients
www.visitcostarica.com
1-866-COSTARICA

Smithsonian contents

JULY 2009 · VOLUME 40, NUMBER 4

FEATURES

34 On the March
The largest contingent of 2,200-year-old terra cotta soldiers ever to leave China is now touring the U.S.
BY ARTHUR LUBOW

44 Nikita in Hollywood
Lunch with Khrushchev was Tinseltown's hottest ticket. And the Soviet leader stole the show
BY PETER CARLSON

52 We Have Liftoff
The launch 40 years ago of *Apollo 11,* which put a man on the moon, was just what we needed
TEXT AND PHOTOGRAPHS BY DAVID BURNETT

Frontiers of Science

56 Birth of a Robot
A new approach to designing robots draws on the ways in which human babies learn about the world
BY ABIGAIL TUCKER PHOTOGRAPHS BY TIMOTHY ARCHIBALD

66 Catching a Wave
Electrical engineer Annette von Jouanne has come up with a swell way to harness the ocean's energy
BY ELIZABETH RUSCH

72 High Hopes for a New Kind of Gene
Scientists believe that microRNA may lead to breakthroughs in diagnosing and treating cancer
BY SYLVIA PAGÁN WESTPHAL

DEPARTMENTS

8 Indelible Images "SALAMI, MR. HOLCOMB?"
A Naval Academy midshipman puts a plebe in his place **BY AMANDA BENSEN**

14 Phenomenon FOREST PRIMEVAL
An earthquake 307 million years ago "froze" a peat swamp that delights scientists today
BY GUY GUGLIOTTA PHOTOGRAPHS BY LAYNE KENNEDY

19 My Kind of Town KEEPING COMPANY
A haven for wildlife, Florida's Sugarloaf Key may be quiet, but it's never lonely
BY BARBARA EHRENREICH PHOTOGRAPHS BY ROBERT WALLIS

80 Presence of Mind THE GREAT ESCAPE
Novelist Thornton Wilder found Douglas, Arizona, the perfect place to unwind **BY TOM MILLER**

3 From the Editor MY FAVORITE COMMIE

4 Letters GEORGE KOVAL, ATOMIC SPY

6 Wild Things COMEBACK TRAIL

12 Your Smithsonian.com CORONADO, CALIF.

18 This Month in History LOU GEHRIG

25 Around the Mall ANT EYE VIEW

26 FROM THE CASTLE FOREVER YOURS

30 THE OBJECT AT HAND STEALTH MACHINE

31 Q & A JEAN SHIN

33 WHAT'S UP WANG MING

92 The Last Page THERE OUGHTA BE A LAW

ON THE COVER Javier Movellan with his kid-friendly robot RUBI.
PHOTOGRAPH BY TIMOTHY ARCHIBALD

THIS PAGE The launch of the historic *Apollo 11* manned lunar mission on July 16, 1969, drew thousands of people to Florida's beaches.
PHOTOGRAPH BY DAVID BURNETT / CONTACT PRESS IMAGES

VISIT SMITHSONIAN.COM

WANT MORE? PLEASE VISIT THE MAGAZINE'S WEB SITE TO EXPLORE NEW ARTICLES, PHOTOGRAPHS, VIDEOS, BLOGS AND MANY OTHER INTERACTIVE FEATURES.

NOW ON
Smithsonian.com

Issue Extras

ALL EYES ON *APOLLO*
View more of photographer David Burnett's images at **Smithsonian.com/apollo11**

ON THE ROAD WITH KHRUSHCHEV
Watch a slide show of Khrushchev's U.S. tour, narrated by author Peter Carlson at **Smithsonian.com/khrushchev**

Web Exclusives

YOUR KIND OF TOWN
Share the story of your hometown in our interactive forum at **Smithsonian.com/yourkindoftown**

BUGGED OUT
Learn how a new museum has New Orleans' historic U.S. Custom House teeming with ants, termites, beetles and more at **Smithsonian.com/insectarium**

FLOWER POWER
See the grand-scale works of podiatrist turned flora photographer Jonathan Singer at **Smithsonian.com/botanica**

PENGUIN DISPATCH
Follow one journalist's journey to the edges of Patagonia to study Magellanic penguins at **Smithsonian.com/penguin**

JOIN US ON **FACEBOOK**
Search *Smithsonian* magazine at **Facebook.com** to read the latest stories, watch new videos and share our content with your friends

STAY CONNECTED: **sign up for regular e-mail updates at Smithsonian.com/newsletter**

Smithsonian Smithsonian.com

EDITOR
Carey Winfrey

ART DIRECTOR
Maria G. Keehan

EXECUTIVE EDITOR
Terence Monmaney

WEB EDITOR
Maura McCarthy

MANAGING EDITOR
Alison C. McLean

SENIOR EDITORS
Kathleen M. Burke
T. A. Frail
Laura Helmuth
Mark Strauss

CONTRIBUTING EDITOR
Robert M. Poole

SENIOR PHOTO EDITOR
Bonnie Stutski

COPY CHIEF
Karen Larkins

***GO SMITHSONIAN* EDITOR**
Beth Py-Lieberman

ASSOCIATE EDITORS
Lyn Garrity
Bruce Hathaway
Marian Smith Holmes
Lucinda Moore

ASSOCIATE ART DIRECTOR
Erik K. Washam

PHOTO EDITOR
Molly Roberts

ASSOCIATE PHOTO EDITOR
Brendan McCabe

STAFF WRITER
Abigail Tucker

ASSOCIATE WEB EDITOR
Brian Wolly

COPY EDITOR
Jeanne Maglaty

ASSISTANT EDITORS
Amanda Bensen
Sarah Zielinski

WEB PRODUCER
Ryan R. Reed

ART SERVICES COORDINATOR
Jeff Campagna

ASSISTANT TO THE EDITOR
Andrea Georgiou

EDITORIAL ASSISTANTS
Megan Gambino
Jesse Rhodes
Michelle L. Strange

READER SERVICES
Karla A. Henry
Carolyn McGhee

INTERN
Joseph Caputo

EDITORIAL OFFICES:
MRC 513,
Washington, D.C. 20013-7012
(202) 633-6090

SUBSCRIPTIONS:
(800) 766-2149
P.O. Box 420312
Palm Coast, FL 32142-0312
Smithsonian.com
Outside the United States:
(386) 447-2721

Views expressed by individual authors do not necessarily represent those of the Smithsonian Institution.

Sorry, but SMITHSONIAN cannot assume responsibility for unsolicited materials.

SMITHSONIAN ENTERPRISES
Thomas Ott, **PRESIDENT**

DIRECTOR, SMITHSONIAN MEDIA
Thomas Ott

EXECUTIVE ASSISTANT TO THE DIRECTOR
James A. Babcock

GENERAL MANAGER
Alan Chu

GROUP PUBLISHER
Kerry Bianchi

ASSOCIATE PUBLISHER, MARKETING AND SALES DEVELOPMENT
Rosie Walker

ADVERTISING
Marilyn Cruz, **ADVERTISING SERVICES MANAGER**

ACCOUNT MANAGERS
NEW YORK: James F. Else, **REGIONAL SALES DIRECTOR,** Diantha W. Redd, **NY SALES DIRECTOR,** Michael D. Preston, Blythe Graham-Jones **MIDWEST:** Bill Milligan, Jeff Orr **DETROIT:** Colleen Maiorana **SOUTHWEST:** Steve Moynihan, Lindsay Davis **SOUTHEAST:** Kelly Hediger, Lisa Herlan **WEST COAST:** Kate Knox, Charles Carroll **CARIBBEAN / CENTRAL AMERICA:** Al Nadal **MEXICO:** Elsie Mendez Enriquez **CANADA:** Richard Brown, Cindy Ratych, David Seaberg, Greg M. Smith **JAPAN:** Yoshinori Ikeda, Shigenori Nagatomo **THAILAND:** Yvan Van Outrive, Ja Pipatra **KOREA:** S.S. Song **DIRECT RESPONSE:** MI Media Services, LLC, Marie Isabelle **INTERACTIVE AD OPERATIONS COORDINATOR:** Joel Newman

MARKETING/RESEARCH
Natalie Thompson, **ASSOCIATE ART DIRECTOR**
Laurie A. Corson, **ASSOCIATE MARKETING DIRECTOR**
Caitlin McCarthy, **ASSOCIATE MARKETING MANAGER**
Elizabeth Stoll, **PROMOTIONS COORDINATOR**
Marilyn Resciniti, **RESEARCH MANAGER**

CONSUMER MARKETING
Lisa Dunham, **CONSUMER MARKETING DIRECTOR**
Mary Ramsey, **PLANNING DIRECTOR**
Andrea Sole, **FULFILLMENT DIRECTOR**
Susan Warner, **RENEWALS AND GIFT DIRECTOR**
Grace Riker, **PURCHASING AND OPERATIONS MANAGER**
Lori Paldino, **DIRECT MAIL MANAGER**
Laura E. Vichick, **DIRECT MAIL COORDINATOR**
Piper Miles-Coccaro, **RENEWALS MARKETING COORDINATOR**

ONLINE PUBLISHING GROUP
Michelle McMahon, **DIRECTOR, INTERNET BUSINESS OPERATIONS AND STRATEGY**
Jennifer L. Bock, **MANAGER, ONLINE MARKETING AND ANALYSIS**
Damie B. Malone, Tony Rosenberger, Bilikya Schiller, **WEB DEVELOPERS**
Kelly Durkin, **SENIOR WEB PRODUCER**
Cheryl Carlin, **JUNIOR WEB PRODUCER**

MANUFACTURING
Sarah Kingsley, **DIRECTOR**
Katherine Balch, **PREPRESS DIRECTOR**
Frank Matthew Hale II, **PREPRESS MANAGER**
Marie Koller, **PREPRESS MANAGER**
Stanley Boone, **COLOR AND QUALITY MANAGER**
Penie Atherton-Hunt, **AD SERVICES MANAGER**

BUSINESS OFFICE
Ed Dequina, **BUSINESS MANAGER**
Beth Cunigan, **ACCOUNTANT**

HUMAN RESOURCES
Dana S. Moreland, **DIRECTOR**
Jennifer N. Alexander, **BUSINESS PARTNER**
Sibyl A. Williams, **HR COORDINATOR**
Jay Sharp, **RECRUITER**

MAIN ADVERTISING OFFICE:
420 Lexington Avenue, Suite 2335
New York, NY 10170
(212) 916-1300

FROM THE EDITOR

My Favorite Commie

Khrushchev Comes to America

BY CAREY WINFREY

"IMAGINE IF PRESIDENT OBAMA invited Kim Jong-il to the United States and then Kim Jong-il said, 'Yeah, I'll come, but how about I travel around the country for two weeks before we meet at Camp David?' and then he went to Hollywood and interacted with Madonna and Beyoncé—that would be roughly comparable." Peter Carlson is talking about Soviet Premier Nikita Khrushchev's extraordinary visit to the United States 50 years ago, which not incidentally is the subject of Carlson's book, *K Blows Top: A Cold War Comic Interlude, Starring Nikita Khrushchev, America's Most Unlikely Tourist*, excerpted herein by the author as "Nikita in Hollywood" (p. 44). Carlson got interested in writing a book about Khrushchev's 14-day visit to the United States nearly 25 years ago, when, as a writer for *People*, he came across some contemporaneous accounts of it. The more he read, the more enthralled he got. Khrushchev "sort of became my favorite Communist dictator—not that that's a tough list to make," he says. "He's so human. He's really funny, and yet he's really thin-skinned. He gets angry, he gets happy. All his emotions are right on the surface. He's just a great character to write about."

Carlson: Emotions right on the surface

Carlson put the project aside when, in 1986, he became a reporter and feature writer for the *Washington Post*, where he also wrote a column about magazines (and had generally nice things to say about this one). Then, a few years ago, he realized the 50th anniversary of the trip was approaching. "If I'm ever going to do anything," he recalls thinking, "I'd better hurry up." So he resumed interviewing journalists who'd covered the event. And when Khrushchev's son, Sergei, came to the National Archives to participate in a panel discussion on the cold war and the Cuban missile crisis, Carlson cornered him for an interview. "Afterwards, he invited me to come see his home movies of the trip," he recalls, "so right after Christmas I flew up to Providence, Rhode Island, where he teaches at Brown University. I brought a plate of my wife's Christmas cookies, and he picked me up at the airport with a couple of salami and cheese sandwiches. We drove to his office at Brown, which was closed for vacation, so there was nobody around. We went to his office and he popped in a DVD, and we sat there and ate the salami and cheese and the Christmas cookies and watched his home movies. That was really cool."

GEORGE RAMICK

GelPro®
Gel Filled Anti-Fatigue Floor Mats
soft gel core
Cordoba
Style & Comfort
Redefined...
"GelPro® Mats are made with a soft shock-absorbing gel material that allows you to stand in comfort on even the hardest tile, wood or concrete floor...great for people with back pain, foot pain or arthritis." HGTV's I Want That!
As seen on HGTV, Fine Living and Food Network, GelPro® Mats have quickly become the must-have accessory in fine homes everywhere. Available in a color and size for every décor. Order yours today and Stand in Comfort.
GelPro® Mats are designed and assembled with pride in the USA.
1-866-GEL MATS (435-6287)
www.gelpro.com

LETTERS READERS RESPOND TO THE **MAY** ISSUE

I am saddened and appalled that the United States' security agencies allowed such an obvious Soviet spy as George Koval ["Iowa-Born, Soviet-Trained"] to operate freely throughout our nuclear facilities and to give the Soviet Union the secrets for making the atom bomb. I wonder how many other spies are operating today within sight of the CIA?

ROBERT E. SAVAGE, FORT MYERS, FLORIDA

BETTER THAN JAMES BOND

THE ARTICLE about Soviet spy George Koval was fascinating, enlightening and far more exciting than anything from author Ian Fleming's imaginative James Bond arsenal. Koval's story was as shocking to the American intelligence community as Soviet spy Kim Philby's was to the British government's MI-5 and MI-6 agencies—and to our own CIA and FBI, since Philby served as the British intelligence liaison with both of those agencies.

JOSEPH R. CALAMIA
EL PASO, TEXAS

PURSUING THE NARWHAL

KUDOS TO biologist Kristin Laidre for taking on such an elusive animal for study ["In Search of the Mysterious Narwhal"]. I hope her efforts are rewarded handsomely and that the scientific community benefits.

GENE HARRISON
MILLSBORO, DELAWARE

NOT ONLY did I enjoy the topic of this article, I was thoroughly impressed by how well written it was. It reads like a short story. Now whom to root for? Laidre for her perseverance or the narwhal for its ability to maintain its fairy-tale-like mystery?

JULIE YUMI ODA
LOS ANGELES, CALIFORNIA

AVOID OUTER SPACE

THE ARTICLE about the suits worn during manned spaceflight ["Suits, Boots and Gloves"] gives a graphic picture of the frailty of protective clothing. What makes anyone think that long-term human space exploration would be possible given this fact, let alone the other problems of sustaining life in outer space? Money thrown away on such programs needs to be put into fixing the very real problem of sustaining life on this planet, the only home humankind will ever have!

STEPHEN JENNEY
NEWARK, NEW JERSEY

JULY 20 will mark the 40th anniversary of the *Apollo 11* lunar landing. Millions of television viewers back on Earth watched astronaut Neil Armstrong take his first historic step on lunar soil and proudly proclaim, "That's one small step for [a] man, one giant leap for mankind." I look up at the Moon and wonder when we will go back. I wonder if we'll ever get to Mars. Human exploration of the Moon, Mars and beyond would restore national pride and serve as an investment in our future and a benefit to humanity. Let's keep the dream alive and make the unknown elements of space known to our world.

RICK SCHREINER
SAN MARINO, CALIFORNIA

LOST FRONTIER?

"COWBOYS AND IMMIGRANTS" speculates on whether two disparate American myths can be reconciled. Evidently, the unabashed, gun-slinging type (exemplified by George W. Bush) and the mild Ellis Island variety (Barack Obama and Franklin Roosevelt) are in need of a marriage to heal rifts in a country beset with contradictions. Such an amalgamation is debatable. The frontier cult of the individual may have seen its day—for Obama now has his foot in the door (albeit tentatively), while a horde of Ellis Islanders with stiffening spines crowd restlessly behind him.

WILLIAM LAMPPA
EMBARRASS, MINNESOTA

AS THE great-great-grandson of 1845 immigrants to the Oregon Country, I find "Cowboys and Immigrants" to be a gross misrepresentation of Western history. The American frontier was not developed by cowboys but rather upon the wit, will and work of courageous farmers and miners with characteristic freedom of spirit and mind (of both men and women). Easterners often fail to understand the mixture of individuality and cooperation that underwrites Western culture. It is unfortunate that modern writers continue to confuse Hollywood imagination and rhetoric with historical reality.

JAMES MORGAN
BELLEVUE, WASHINGTON

Please send letters to **LettersEd@si.edu** or to **Letters, Smithsonian, MRC 513, P.O. Box 37012, Washington, D.C. 20013.** Include a telephone number and address. Letters may be edited for clarity or space. Because of the high volume of mail we receive, we cannot respond to all letters. Send queries about the Smithsonian Institution to info@si.edu or to VIARC, Public Inquiry Mail Service, P.O. Box 37012, Washington, D.C. 20013.

Don’t leave future generations your problems. Leave them your car.

Meet the Forester. Built at our plant that produces zero landfill waste, and built to last. In fact, 94% of Subaru vehicles sold in the last decade are still on the road.* It’s a car even future generations can appreciate. **Love. It’s what makes a Subaru, a Subaru.**

SUBARU

Forester.® Well-equipped at $20,295†

*Based on R. L. Polk & Co. registration data in the U.S. from 1998 to 2008. †MSRP excludes destination and delivery charges, tax, title and registration fees. Dealer sets actual price. 2010 Subaru Forester 2.5X Premium pictured above has an MSRP of $22,795.

WILD THINGS

LIFE AS WE KNOW IT

BY AMANDA BENSEN, JOSEPH CAPUTO, T.A. FRAIL, LAURA HELMUTH AND ABIGAIL TUCKER

COMEBACK TRAIL

Whalers killed tens of thousands of blue whales before their hunting was banned in 1966. Today, the largest animals on earth are showing encouraging signs of rebounding. Identifying individual blue whales in the Pacific Ocean since 1997, scientists from the Cascadia Research Collective and elsewhere found that the animals are once again migrating from California to British Columbia and Alaska.

Observed

NAME: Snowball, a sulphur-crested cockatoo (*Cacatua galerita eleonara*).
MOVES: Bobs head, lifts leg to the tune of the Backstreet Boys' "Everybody."
DISCOVERED: On YouTube. By scientists who then studied the bird's behavior.
ANALYZED: When the tempo of the music changed, the bird changed the pace of his head bobbing and leg lifting accordingly. Writing in *Current Biology*, the scientists call this "moving in rhythmic synchrony with a musical beat." Others call it dancing.
NOT ALONE: A second analysis, in the same journal, of more than 1,000 animal videos on YouTube suggests that other animals that learn through vocal mimicry—songbirds, seals, elephants, some bats and others—may have the same ability.

A SAFE LANDING

Bumblebees search for flower petals that offer traction, University of Cambridge-led scientists have shown. Some petals are smooth and slippery, but others have cone-shaped cells that act like Velcro when bees touch down. The reward for sticking the landing? Bees can guzzle nectar more readily. For the flowers' part, more and longer visits by bees increase the chances of pollination.

NOT BAD FOR POND SCUM

Volvox are single-celled algae that live in spherical colonies containing thousands of cells. When the cells twirl their flagella, the whole colony spins. Now biophysicists in England and Japan say *Volvox* colonies interact in unexpected ways. In a "waltz" (right), they revolve around each other. In a "minuet," they hover farther apart. The scientists speculate that the coordinated movements increase the chances of cross-colony fertilization.

IN PLAIN SIGHT

Where in the world could millions of 20-foot-tall trees flourish across an area larger than Delaware without scientists noticing them? In remote and war-torn hills between Ethiopia and Somalia. An Uppsala University botanist recently documented, for the first time, *Acacia fumosa*, a common tree with gray bark and pink flowers. More than 2,000 new species of flowering plants are described worldwide each year, but few are this conspicuous and widespread.

Watch the parrot and algae dance at Smithsonian.com/WildThings

MIKE JOHNSON / SEAPICS.COM; IRENA SCHULZ (9); PAUL JOHNS; MATS THULIN; KNUT DRESCHER AND RAYMOND E. GOLDSTEIN / UNIVERSITY OF CAMBRIDG

HISTORIC SIGNIFICANCE.
TIMELESS BEAUTY.

UNITED STATES MINT

[The 2009 ULTRA HIGH RELIEF DOUBLE EAGLE GOLD COIN ~ by AUGUSTUS SAINT-GAUDENS]

Minted in 24-karat gold exclusively for 2009 | usmint.gov/timeless | 1-800-USA-MINT

©2009 United States Mint

"Salami, Mr. Holcomb?"

The first women to attend the Naval Academy became seniors in 1979. Photojournalist

LUCIAN PERKINS

Lucian Perkins was on deck as the old order changed **BY AMANDA BENSEN**

DON HOLCOMB was new to the United States Naval Academy, still in the grueling orientation period known as "plebe summer." Sandee Irwin was a midshipman first class—a senior. One day in July 1979, while Holcomb was still getting used to the academy's intense memorization drills, Irwin ordered him to recite the lunch menu.

"Tater tots, ham, luncheon meats," he spouted, according to a contemporary report in the *Washington Post*. "Swiss cheese, sliced tomatoes, lettuce, mayonnaise, submarine rolls, macaroon cookies, iced tea with lemon wedges, milk . . . uh . . . ma'am."

"Did I hear salami, Mr. Holcomb?" she demanded.

She had not. She should have. Holcomb and his fellow plebes had pulled in their chins like nervous turtles, a punishing position known as "bracing up." Now he prepared for a verbal gale.

"I don't remember the words she used, but I remember the tone," recalls Lucian Perkins, then a *Post* intern on hand to photograph the rites of plebe summer. He snapped his shutter.

The academy had been the exclusive domain of men until 1976, when it admitted 81 women, about 6 percent of the freshman class; in 1979, the senior class included women for the first time in the academy's 134-year history. Images of a

Now serving grief: Irwin (right) gives Holcomb (left) a lesson on why no plebe should ever forget the menu.

Few people knew his father was a vice admiral. She certainly didn't.

"This was . . . kind of a historic thing," says Holcomb (with Irwin at Annapolis in May 2009), "but when you're getting screamed at, it doesn't matter if it's a he or a she."

woman commanding men were rare enough to make the *Post*'s front page.

In the moment, though, Holcomb didn't quite grasp the significance. "We knew this was the first class with women, kind of a historic thing," he says, "but when you're getting screamed at, it doesn't matter if it's a he or a she."

A day or two later, Irwin opened her dorm room door and reached down to pick up her daily copy of the *Post*—where, sure enough, the photograph appeared on Page 1. "Oh, [expletive]," she recalls thinking. "This isn't going to be a good day."

A few minutes later, one of her male classmates stormed into the room. "He slams the paper down," Irwin remembers, "looks at me and says: 'We are not impressed.' But you know what? My parents were proud. And as long as I was making my parents proud, I didn't care what anyone else thought."

Irwin had gone to the academy not to make a point, but to get a low-cost education—and a career. She says she had been a "California girl," a perky cheerleader from the Bay Area city of Livermore, but she was also determined to become the first member of her family to graduate from college. While nearly one-third of her female classmates would drop out (as would one-quarter of the men), she would make it to the end.

Over the next several weeks, Irwin received hundreds of letters from people who had seen the photograph, which had been widely distributed through the Associated Press. Some were congratulatory and supportive, even grateful. Others contained death threats. (Navy investigators held on to those.)

"I never feared for my life," she says. "But some of them quoted the Bible to say that women should not be in positions of power, and I'm a Christian, so I would have liked to debate them on that. Of course, none of them were signed."

Holcomb, too, squirmed in the spotlight. He had been trying hard to blend in with the other plebes—few people on campus knew that his father, M. Staser Holcomb, was a vice admiral. Irwin certainly didn't.

"I didn't want to get any special attention or favors, so I didn't tell her," Holcomb says. He took some ribbing from upperclassmen, mostly for his bad brace position (his chin wasn't in far enough), but for him the episode blew over pretty quickly.

Irwin, too, thought it had blown over when she started working for the chief information officer at the Pentagon the next year. But one day her boss found an excuse to send her on an errand to Vice Adm. Holcomb's office.

"You could see everyone around start to snicker because they knew who I was. I'm thinking, 'Oh, God, I'm dead,'" she says. "But he walks out from behind his desk, shakes my hand and laughs. He said, 'If my son forgot something, he deserved to be yelled at.'"

As a public affairs officer, Irwin spent eight years on active duty in the Navy and three in the reserves; she rejoined the reserves in 1999, and after September 11, 2001, was mobilized for almost two more years. Now a captain, she plans to retire next summer.

She was single until last year, when she married Steve Young ("At 50, I became Young!" she cracks), a biochemist she met in her current job as a spokeswoman for the biotech firm Amgen.

Holcomb spent 22 years as a Naval officer, mostly on nuclear submarines (where, coincidentally, women are still barred from serving). He retired as a commander in 2005, and now, at 48, works for a private defense contractor in Virginia, where he lives with his wife, Jayme, a lawyer. His three children are grown.

Lucian Perkins (in 2009): "I remember her tone."

As for Perkins, he was hired by the *Post* a few months after he shot the encounter and worked for the paper for 27 years; he has won several major awards, including two shared Pulitzer Prizes and a World Press Photo of the Year award. Now 56, he freelances out of his home in Washington, D.C., where his photograph of Irwin and Holcomb hangs in a hallway.

AMANDA BENSEN *is an assistant editor at the magazine.*

See more of Lucian Perkins' photos at Smithsonian.com/perkins

LUCIAN PERKINS; SARAH TANGUY

room upgrade: automatic

preferred seating
access: on us

massage: included

chef's table:
our treat

your own perfect world: priceless

Your World MasterCard® comes with rewards, offers and perks that matter to you. Whether it's a deep tissue massage or a seat at the chef's table, you decide what's in your perfect world. Plus, with your US Airways® Dividend Miles® Premier World MasterCard® you can earn double miles and get First-class check-in and Zone 2 boarding when you book a flight through US Airways.* Offers may vary. Go to priceless.com/world and register for more details.

WORLD
MASTERCARD

*All terms and conditions of the Dividend Miles program apply. US Airways reserves the right to change the Dividend Miles program and its terms and conditions at any time without notice. Any such changes may affect your ability to use the awards or mileage credits that you have accumulated. For complete details about the Dividend Miles program visit www.dividendmiles.com. Offers are illustrative. Actual offers may vary. Terms and conditions apply. Go to priceless.com/world and register for more details. MasterCard, Priceless and World MasterCard are registered trademarks of MasterCard International Incorporated and are used by the issuer pursuant to a license. ©2009 MasterCard

YOUR SMITHSONIAN.COM

READER CONTRIBUTIONS TO OUR WEB SITE

NUCLEAR TRAITOR

After [British atomic spy] Klaus Fuchs (left) was released from prison in Britain in June 1959, he taught physics in Dresden, East Germany. One of his "pupils" was Qian Sanqiang, mastermind of Mao Zedong's A-bomb project. Fuchs gave Qian the full details of the plutonium-design atomic bomb, and possibly information on the thermonuclear bomb, according to 2009's *The Nuclear Express* by Tom Reed and Danny Stillman.

—Cynthia Kelly, of the Atomic Heritage Foundation, Washington, D.C., on "Spies Who Spilled Atomic Bomb Secrets" Smithsonian.com/spies

SMITHSONIAN.COM POLL

HUNGRY FOR A TRENDY GRAIN?

Online readers who say they eat quinoa:

OFTEN: It's a staple in my kitchen!	**44%**
SOMETIMES: I don't usually think of it when shopping.	**42%**
NEVER: I tried it and didn't like it.	**8%**
Kin-what? This is the first I've heard of it.	**6%**

VOTE AT the Food and Think blog, Smithsonian.com/quinoa

PHOTO CONTEST READERS' PICK

"The picture was taken at the Miami Metro Zoo's Pelican Cove on a mostly cloudy day. I took the picture as some sun rays were coming through the clouds. The perfect lighting and the serene scene inspired me." **—Jackie Cosio-Arias,** of Miami, on photographing a white pelican in repose in March 2007

Visit our Web site to submit a photo to our 7th annual contest.

YOUR KIND OF TOWN

BY PETER BRADFORD • CORONADO, CALIFORNIA

HAVING ONLY THREE CHANNELS on our black-and-white TV, no computers, one car in the family and a military background, we were often booted out of the house in the morning with admonitions to not return until dinner. My mother said if we ran into trouble or got hurt, "Find a sailor. . . . He'll help you." Sadly, I can't imagine a mother giving that advice to a 10-year-old boy today. Access to Coronado was primarily by ferry, so it was a quiet town, with the bay on one side and the Pacific Ocean on the other. We went to school on foot or by bike, and in the sixth and seventh grade we would strap a roller skate to our long and very heavy surfboards and at the last bell ride directly to the beach for a couple of hours of surfing, neophyte-style. Most of the places I remember are gone, with condos replacing Navy housing and home prices few can afford, but the memories are there, along with a little pride in saying, "My hometown is Coronado."

Submit a **Your Kind of Town** story or photograph and find others at Smithsonian.com/yourkindoftown

EVENING STANDARD / GETTY IMAGES; GOSS IMAGES / ALAMY; IMAGE SOURCE / PHOTOLIBRARY; JACKIE COSIO-ARIAS

HARBOR HOPPING

The New England Islands

8 Day/7 Night Cruise

Forged from the forces of retreating glaciers, the harbors, bays and islands of New England offer discovery and stunning beauty around every bend. Home to puritans and pirates, pilgrims and patriots, New England's history is a tapestry woven rich in significance and fascinating details.

Now it's your turn to explore this cornerstone of America while cruising on the newest small cruise ships in the world. Our ships accommodate just 100 guests, a perfect way to arrive at the heart of it all.

You'll experience eight days of smooth water, beauty, culture and history, all while enjoying the camaraderie of fellow passengers and the exemplary personal attention that is the hallmark of American Cruise Lines.

1-800-460-6187
Call for your Free Brochure

AMERICAN CRUISE LINES INC
Small-Ship Cruising Done Perfectly

Martha's Vineyard • Nantucket Island • New Bedford • Block Island • Newport • Providence

Forest Primeval

An Illinois coal mine holds the world's largest fossil wilderness, a snapshot of life on earth 300 million years ago

BY GUY GUGLIOTTA PHOTOGRAPHS BY LAYNE KENNEDY

FINDING A FOSSIL IN a coal mine is no big deal. Coal deposits, after all, are petrified peat swamps, and peat is made from decaying plants, which leave their imprints in mud and clay as it hardens into shale stone.

But it was a different thing entirely when John Nelson and Scott Elrick, geologists with the Illinois State Geological Survey, examined the Riola and Vermilion Grove coal mines in eastern Illinois. Etched into ceilings of the mine shafts is the largest intact fossil forest ever seen—at least four square miles of tropical wilderness preserved 307 million years ago. That's when an earthquake suddenly lowered the swamp 15 to 30 feet and mud and sand rushed in, covering everything with sediment and killing trees and other plants. "It must have happened in a matter of weeks," says Elrick. "What we see here is the death of a peat swamp, a moment in geologic time frozen by an accident of nature."

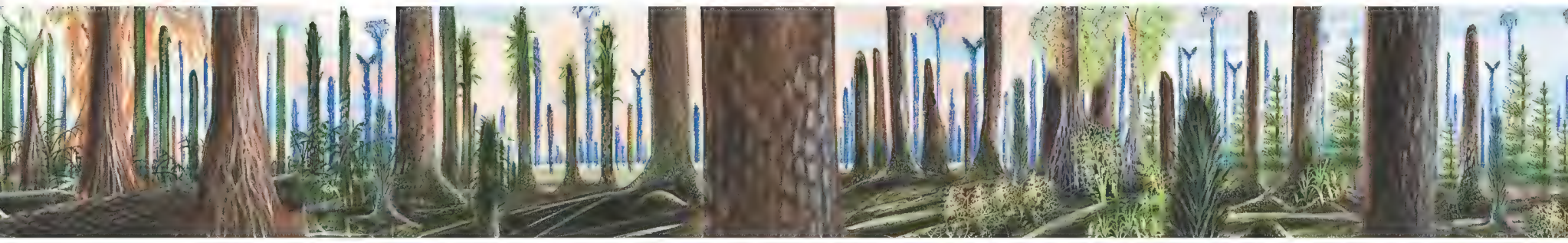
The mostly intact fossilized forest (clockwise from left: the tip of a tree fern frond; foliage from a tree fern; a lycopsid branch) is a "spectacular discovery," paleobotanists say.

To see this little-known wonder, I joined Nelson and Elrick at the Vermilion Grove site, a working mine operated by St. Louis-based Peabody Energy and closed to the public. I donned a hard hat, a light, gloves and steel-toed boots. I received an oxygen bottle and a safety lecture. In case of emergency—poison gas, fire or an explosion—follow the red lights to find the way out of the mine, safety manager Mike Middlemas counseled. We could encounter "thick black smoke, and you won't be able to see anything in front of you." He said to use the lifeline running along the ceiling, a slender rope threaded through wooden cones, like floats in a swimming pool.

The fossil-rich coal seam is 230 feet below ground, and we rode there in an open-sided, Humvee-like diesel jitney known as a "man-trip." The driver took us through four miles of bewildering twists and turns in tunnels illuminated only by escape beacons and the vehicle's headlights. The journey took 30 minutes and ended in Area 5. The tunnels here are 6.5 feet high and about the width of a two-way suburban street.

The tunnels were silent and, lit by low-wattage bulbs, gloomy. Humid summer air, drawn in from above, was chilly and clingy underground, where temperatures hover around 60 degrees Fahrenheit year-round. Miners are finished extracting coal here, and the sides of the tunnel have been sprayed with quicklime to suppress explosive coal dust. The shale roof—made of the sediment that destroyed the forest so long ago—is cracking and flaking off now that the coal below it has been removed. Wire mesh covers the ceiling to prevent big

ILLUSTRATION: MARY PARRISH (WITH BILL DIMICHELE AS SCIENTIFIC ADVISER) / NATIONAL MUSEUM OF NATURAL HISTORY, SI



pieces from falling into the roadways or hitting miners.

Nelson picked his way along the tunnel, stepping around piles of broken stone and lumps of coal tumbled like black dice across the dusty floor. He stopped and looked upward. There, shining in the glow from his helmet light, is the forest—a riot of intertwined tree trunks, leaves, fern fronds and twigs silhouetted black-on-gray on the clammy shale surface of the tunnel roof. "I had seen fossils before, but nothing like this," he says.

Nelson, who is now retired, first visited the Riola-Vermilion Grove site during a routine inspection shortly after the mine opened in 1998. He spotted fossils but didn't pay much attention to them. He saw more fossils when he inspected different tunnels the next year, and still more the year after that. Elrick joined him in 2005, and by then the fossils added up to "too many," Elrick says. "Something odd was going on."

Nelson called in two paleobotanists, William DiMichele, of the Smithsonian's National Museum of Natural History, and Howard Falcon-Lang, of Britain's University of Bristol, to view the site. Falcon-Lang describes it as "a spectacular discovery" because the whole forest—not just individual

The remains of a forest of lycopsids and other oddities (above: an illustration) is 230 feet underground (John Nelson, left, and Scott Elrick inspect a mine shaft ceiling rich in fossils).

The site opens a window on the natural world just prior to a period of great, and puzzling, change.

trees or plants—is intact on the ceiling. Most ancient peat forests die gradually, leaving only spotty evidence of what grew there. Because this one was buried all at once, almost everything that was there is still there. "We can look at the trees and the surrounding vegetation and try to understand the whole forest," says DiMichele.

The lords of this jungle were the lycopsids: scaly plants with trunks up to 6 feet in circumference that grew up to 120 feet in height and bore spore-producing cones. They looked like giant asparagus spears. In the pale light of the tunnel, 30-foot fossil traces of lycopsid gleam slickly in the shale roof like alligator skins.

Next to the lycopsids are calamites—30-foot-tall cousins of the modern-day horsetail—and ancient, mangrove-size conifers known as cordaites. Seed ferns (which are unrelated to modern ferns) grew 25 feet tall. Tree ferns grew 30 feet, with crowns of large, feathery fronds.

Few animal fossils have been found in the mine—chemicals in the ancient swamp's water may have dissolved shells and bones—but other sites from more than 300 million years ago, a period known as the Carboniferous, have yielded fossils of millipedes, spiders,

Did an abrupt climate shift 306 million years ago doom the ancient ecosystem? Fossils from the Vermilion Grove coal mine (above) may hold clues.

cockroaches and amphibians. Monster dragonflies with 2.5-foot wingspans ruled the skies. (It would be another 70 million years before the first dinosaurs.)

And then the earthquake struck, and this swampy rain forest was gone.

One of the reasons the site is so valuable to scientists is that it opens a window on the natural world just prior to a period of great, and puzzling, change. For several hundred thousand years after this rain forest was entombed, tree ferns, lycopsids and other plants competed for dominance—"a kind of vegetational chaos," says DiMichele. For some unknown reason, the tree ferns prevailed, he says, and eventually took over the world's tropical wetland forests. Two-thirds of the species found in Riola-Vermilion Grove would vanish. The mighty lycopsids virtually disappeared.

Researchers offer several possible reasons for the great makeover in plant communities around 306 million years ago: precipitous changes in global temperatures; drying in the tropics; or, perhaps, tectonic upheaval that eroded even older coal deposits, exposing carbon that then turned into carbon dioxide. Whatever the reason, earth's atmosphere suddenly acquired a lot more carbon dioxide. Determining the relationship between this ancient atmospheric change and the changes in vegetation could offer clues about how today's ecosystem will react to carbon dioxide increases caused by the burning of fossil fuels.

The Riola-Vermilion Grove team, DiMichele says, is using the fossil forest as a reference point. The researchers are analyzing the chemical makeup of earlier and later coal deposits for measures of ancient carbon dioxide, temperature, rainfall and other variables. So far, the rise in carbon dioxide seems to be fairly smooth over time, but the change in vegetation is jerkier.

Comparing fossils from before 306 million years ago and after, "you have a total regime change without much warning," says DiMichele. "We need to look much more closely at the past," he adds. "And this is our first opportunity to see it all."

GUY GUGLIOTTA *has written about cheetahs and human migrations for* SMITHSONIAN.

Columbia Valley, Washington

WASHINGTON STATE

Some vacations are just too good to leave behind.

If your taste for adventure is colored in reds and whites, visit Washington State. Our wine regions enjoy 300-plus days of sunshine every year and some of the best wines in the world. Call **800-544-1800** or visit **experiencewa.com** today for your **FREE** Official Washington State Travel Planner.

experiencewa.com

THIS MONTH IN HISTORY

JULY ANNIVERSARIES

MOMENTOUS OR MERELY MEMORABLE

BY ALISON McLEAN

70 YEARS AGO
UNLUCKY BREAK

His words echoing through New York's Yankee Stadium, Lou Gehrig, 36, declares himself the "luckiest man on the face of the earth," July 4, 1939. In the wake of his "bad break"—a diagnosis of amyotrophic lateral sclerosis—Gehrig, who had played a record 2,130 consecutive games, is honored by more than 60,000 fans. He will die of ALS—now also known as Lou Gehrig's disease—in 1941.

40 YEARS AGO
MAN ON THE MOON

"That's one small step for [a] man, one giant leap for mankind." As millions around the world watch on TV, at 10:56 p.m. EDT July 20, 1969, *Apollo 11* astronaut Neil Armstrong takes the first human steps on the moon, with Buzz Aldrin at his heels (Aldrin shoots a footprint, right, to record the effects of pressure on the lunar dust). They explore the surface for more than two hours, collect 47 pounds of lunar samples and return to Earth 195 hours after leaving. (For moonshot festivities on the ground, see p. 52.)

220 YEARS AGO VIVE LA LIBERTÉ

On July 14, 1789, a Parisian mob, certain that King Louis XVI's dismissal of France's finance minister heralds a crackdown against the new populist National Assembly, storms the 14th-century Bastille prison to capture the arms and gunpowder inside. Although the Bastille, a symbol of royal power, held only seven prisoners, its liberation lights the fires of the French Revolution. France declares Bastille Day a national holiday in 1880.

210 YEARS AGO THE SECRET IN THE STONE

In mid-July 1799, French soldiers occupying Egypt find a stone block in the town of el-Rashid (Rosetta) inscribed with three scripts: hieroglyphics, demotic (an Egyptian cursive) and Greek. Although linguists can read only the Greek, it indicates the stone dates from 196 B.C. and that all three texts convey the same decree by priests of Ptolemy V. The stone provides the key that scholars, notably French linguist Jean-François Champollion, use to crack the hieroglyphic code and advance the new field of Egyptology.

240 YEARS AGO MISSION ACCOMPLISHED

Franciscan friar Junipero Serra founds the first of 21 missions in what is now California in the new Spanish settlement of San Diego, July 16, 1769. Mission San Diego de Alcala, part of Spain's strategy to gain control of the Pacific Coast, grows to 50,000 acres. Its relations with the local people that the friars seek to "civilize" are tense: an Indian revolt burns the mission in 1775; European illnesses fell the native population. Secularized in 1834, the mission, after use in the 1850s as a U.S. artillery base, is returned to the Catholic Church in 1892.

CORBIS; RUE DES ARCHIVES / GRANGER COLLECTION, NEW YORK; BETTMANN / CORBIS; © THE TRUSTEES OF THE BRITISH MUSEUM; GRANGER COLLECTION, NEW YORK

Visit Smithsonian.com/history for "Today in History"

MY KIND OF TOWN

SUGARLOAF KEY, FLORIDA

Keeping Company

Observing ibises and kayaking among sharks, the noted writer savors life "up the Keys"

BY BARBARA EHRENREICH PHOTOGRAPHS BY ROBERT WALLIS

LEFT: STEPHEN VOSS / WPN

IN MY CASE, ANYWAY, geography is hard to disentangle from biography. For almost 20 years I endured the aesthetic deprivations of a lower-middle-class suburb so that my children could go to the town's first-rate public schools. Then the kids grew up and moved out and, independently of that, my marriage crumbled. I made a mad midlife dash to Key West, where I had a few friends and soon took up with a good-looking, outdoorsy local. We liked our Old Town condo well enough, but eventually, worn down by the all-night pool parties in the guesthouses next door, decided to look for a place of our own "up the Keys," where the

Fascinated by the white ibises that roost on a nearby mangrove island (above), the author (left) likes to kayak out to watch them and puzzle on what triggers their flight.

Here, you think of global warming as the vivid, if remote, possibility of being eaten in bed by sharks.

property was cheaper and the nights still as death.

The second, and last, place we looked at was on Sugarloaf Key, a patch of land jutting out into the Gulf of Mexico from the lone highway connecting the necklace of islands that make up Florida's Keys. We drove to the end of the paved road, then onto a dirt road cutting through a low jungle of indigenous buttonwoods, poisonwoods, sea grapes and thatch palms. At the end of that was a pleasant gray house linked to the water by a boardwalk and dock, and at the end of the dock was a revelation: more than 180 degrees of turquoise water dotted with a series of tiny emerald mangrove islands. *Live here*, said a voice from the blue-green vastness—*whatever it takes*.

Sugarloaf Key's allure may lie in its lack of commercialism (above: its small strip mall) as well as the "velvet silence" of its nights and the "undulating traffic of stingrays."

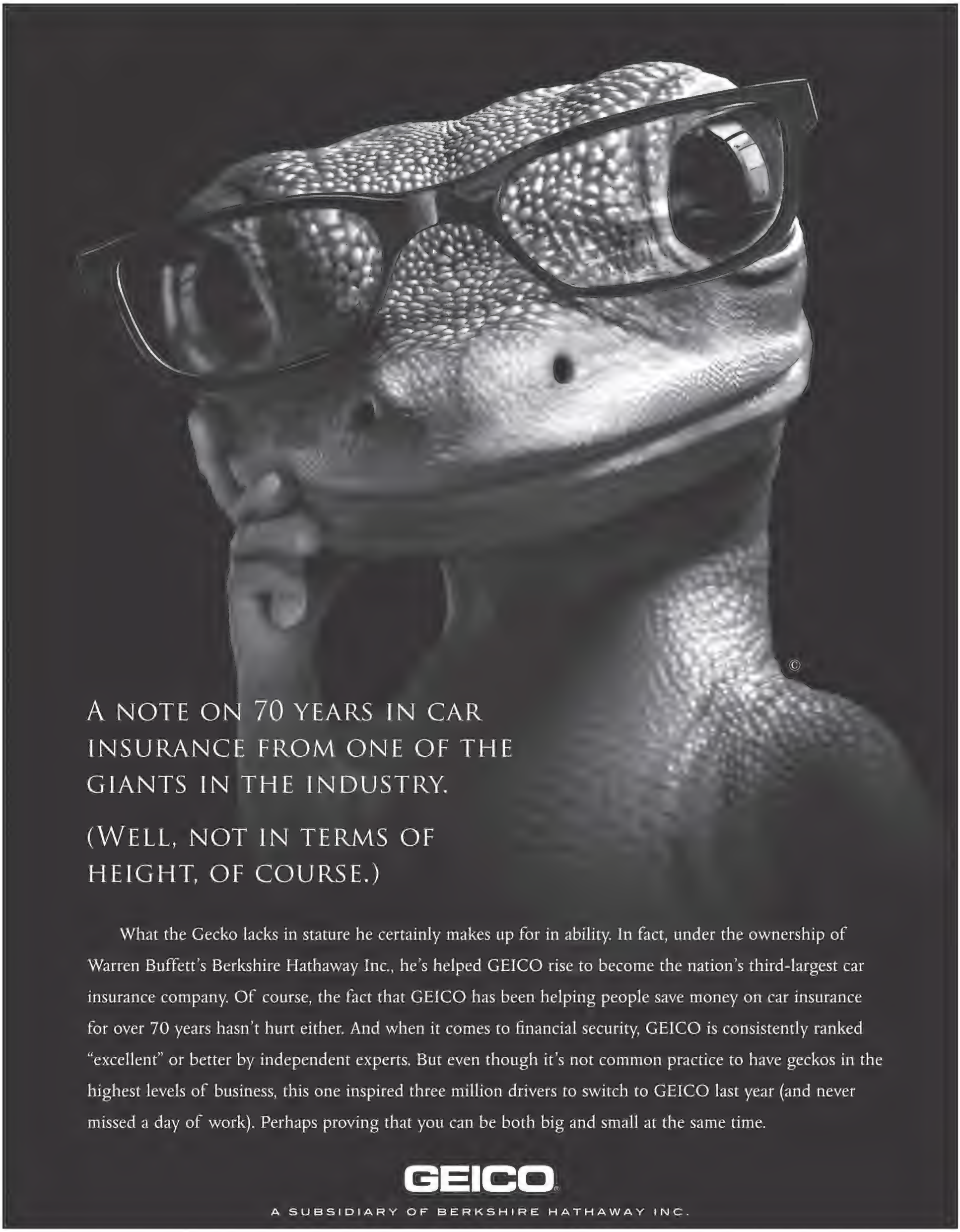
It took far less than it might have because the former owner had the interior decorating tastes of a serial killer. All floor space was occupied by mounds of old newspapers, receipts, porn magazines and crusty Styrofoam containers. We had the place cleaned out and painted, hauled up some used furniture from a store in Key West, and settled back to savor the gaudy sunsets and try to figure out what kind of a wild place we were settling.

Down in Key West, you can imagine you are in a patch of urban civilization, slightly shiftless and *louche*, but well-stocked with restaurants, supermarkets, gossip and dense human drama. In fact you could live your whole life on Key West, if you chose, without bothering to notice that you were on an island suspended more than 100 miles below the Florida peninsula in the middle of the Caribbean. But on Sugarloaf there was no evading the fragility of our existence. Under us, a thin uprising of fossilized coral; to the south, the Atlantic; to the north, the Gulf. Here, you don't think of global warming as an "issue," but as the vivid, if remote, possibility of being eaten in bed by sharks.

The very idea of an Atlantic and Gulf side is a conceit more appropriate to continent-dwellers, because there is, of course, just one all-surrounding sea. But our side, the Gulf side, a.k.a. the "backcountry," is different in ways that can make townsfolk a little uneasy. Before moving up there, I remember talking to a sponger—that is, a man who fished for sponges in the shallow transparent waters of the backcountry—and he spoke about the velvet silence of the tropical nights, the smooth undulating traffic of stingrays and sharks. But then he faltered as if there were something he couldn't figure out how to say or even whether to say it.

I wouldn't be overwhelmed, I thought, because I am a scientist or at least a scientist *manquée*. I could make observations—of the birds, for example. Portions of Sugarloaf are included in the Great White Heron National Wildlife Refuge, but it's the ibises that fascinate me. They tend to move in groups of 6 to 30, suggesting some rudiments of social organization. As the sun sets, they flock to a nearby mangrove island to roost for the night; at sunrise or thereabouts, they take off again for their feeding grounds. I would kayak out to watch both events. The morning liftoff can occur before or at sunrise, and it can be either messy and anarchic or a single, coordinated action involving up to 100 birds at a time. What, I wanted to know, determined the timing and nature of the liftoff? A couple of years later, when I put this question to an old friend and animal behaviorist, Jack Bradbury, a professor emeritus at Cornell University, he told me, essentially, that there were probably some leaders and trendsetters among the ibises, but there was also simply safety in traveling in numbers. In other words, within certain parameters like hunger and the need to stick together, they do pretty much what they damn well please.

The dolphins, though, became the freewill stars of my new cosmos. I'd never know when or where I'd run into them, in what season or depth of water, and whether it would be a single one or a pod. I was out on my kayak one day when I noticed some furious


A NOTE ON 70 YEARS IN CAR INSURANCE FROM ONE OF THE GIANTS IN THE INDUSTRY.
(WELL, NOT IN TERMS OF HEIGHT, OF COURSE.)
What the Gecko lacks in stature he certainly makes up for in ability. In fact, under the ownership of Warren Buffett's Berkshire Hathaway Inc., he's helped GEICO rise to become the nation's third-largest car insurance company. Of course, the fact that GEICO has been helping people save money on car insurance for over 70 years hasn't hurt either. And when it comes to financial security, GEICO is consistently ranked "excellent" or better by independent experts. But even though it's not common practice to have geckos in the highest levels of business, this one inspired three million drivers to switch to GEICO last year (and never missed a day of work). Perhaps proving that you can be both big and small at the same time.
GEICO
A SUBSIDIARY OF BERKSHIRE HATHAWAY INC.

GEICO is the third-largest private passenger auto insurer in the United States based on 2008 market share data as reported by the National Association of Insurance Commissioners, March 2009. At December 31, 2008 Government Employees Insurance Company had admitted assets of $12.5 billion, and policyholder surplus of $4.1 billion (including $33.4 million in paid up capital stock). Total liabilities were $8.4 billion, including $7.7 billion in reserves. Additional information is available at: http://www.geico.com/about/corporate/financial-information/". Government Employees Insurance Co. • GEICO General Insurance Co. • GEICO Indemnity Co. • GEICO Casualty Co. These companies are subsidiaries of Berkshire Hathaway Inc. GEICO: Washington, D.C. 20076. GEICO Gecko image © 1999 – 2009. © 2009 GEICO

Dolphins would swim alongside the kayak, then vanish under it and pop up on opposite sides with wide grins.

splashing off to the north. Paddling to the action as fast I could, I saw two dolphins playing some rough, elegant game involving alternating leaps out of the water, and when they saw me, they decided to include me in it. They'd swim alongside the kayak, then vanish under it and pop up dramatically on opposite sides with those wide dolphin grins on their faces. This went on for about a half-hour, until they zipped off to find a better player.

Meanwhile things were not going well with the one human in my daily life. It turned out he acutely missed Key West, where his afternoon round of errands on bike could easily involve a half-dozen conversations. On Sugarloaf, our nearest errand destination was Jen's grocery store, three miles away, where we got our newspapers, mail and a little chatter about, say, a crocodile sighting or the possibility of a front coming through. ("Weather" is too static a word for what we have in the Keys; instead we have "fronts.") My companion wanted to spend more long, boozy evenings in Key West with friends. I didn't want to miss a sunset, a moonrise or whatever other show might be playing.

And there was so much going on, especially in spring and summer when the water cycle goes into overdrive. All day the sky sucks steam from the warm seas, dumping it back in the psychotic violence of a late afternoon squall, then finishing up with a sweet consoling rainbow. You might get waterspouts skidding across the Gulf in late summer, miniature tornadoes that mainly bother the birds but can take off a roof. One July night, we stepped outside to find the horizon ringed with at least six discrete lightning storms, each in its own separate sphere of pyrotechnics, leading my friend—a man not known for metaphysical pronouncements—to mutter, "There *is* a God."

Was it a god? I am not a religious person, but I began to understand that I was being drawn into something, maybe into that very thing that the sponger had hesitated to describe. I came to think of it as the Presence, what scientists might call an "emergent quality," something greater than the sum of all its parts—the birds and cloudscapes and glittering Milky Way—that begins to feel like a single living, breathing Other.

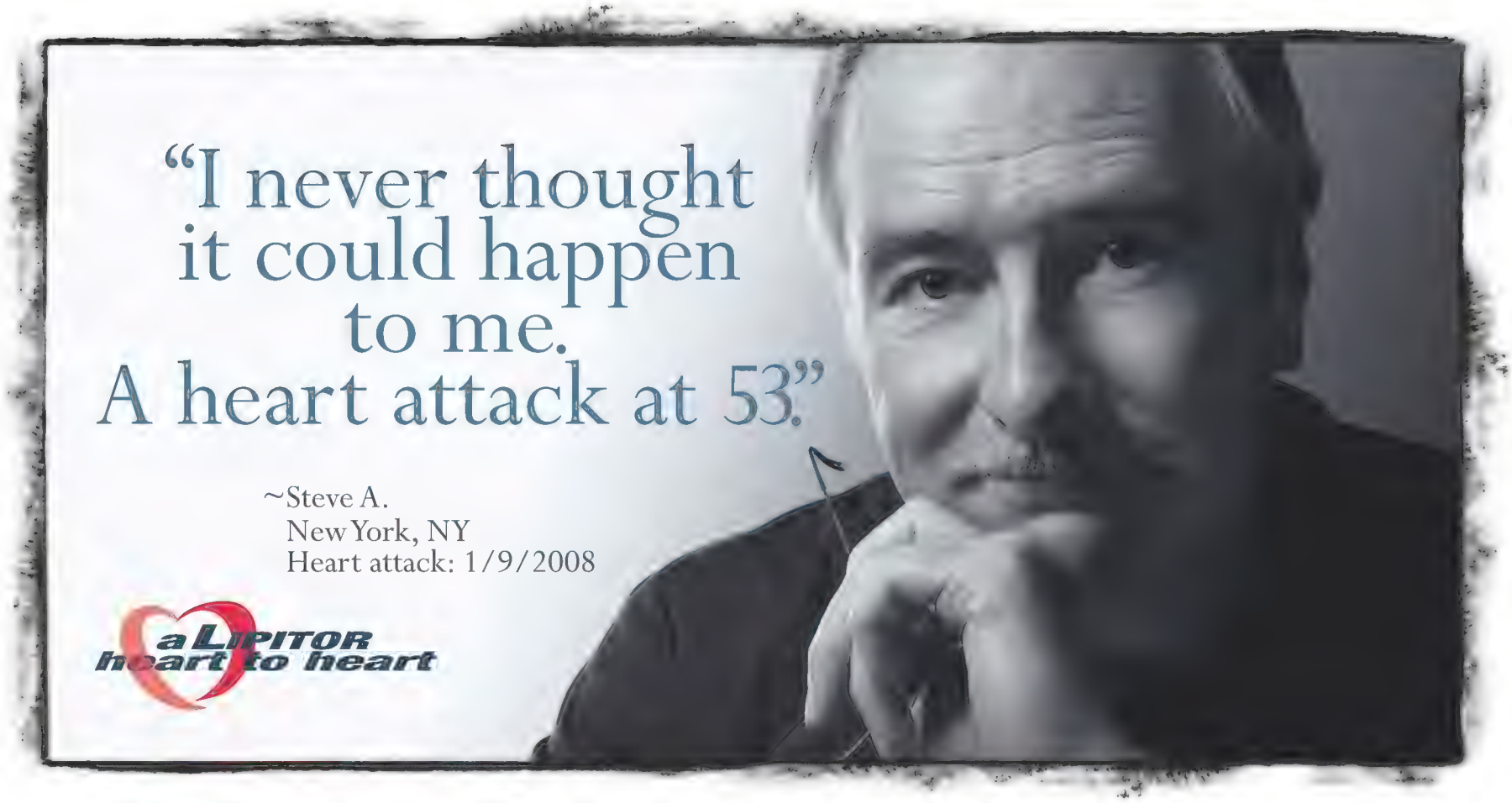
It is not always benevolent, this Presence. Oh, it can be as seductive as the scent of joewood flowers riding on a warm November breeze, as uplifting as the towering pink, self-important, Maxfield Parrish-type cumulus clouds that line up to worship the rising sun. But then, just like that, it can turn on you. I've gone out on the water on a perfectly inviting day only to find myself fighting for my life against a sudden wind and seas that had turned into foam. I learned to take kayaking more seriously—never going out without a water bottle, some trail mix and a plastic container for bailing. I learned to keep going when survival was not guaranteed, did not even seem likely, by uttering a loud, guttural "unhh!" with each stroke of the paddle—who was there to hear?—as a way of transcending exhaustion and fear.

When my companion and I separated, I held on to Sugarloaf and still go there when I can afford to and don't have a tenant. I get up at sunrise and go down to the dock to check out the fauna—the parrotfish, the snappers, maybe a barracuda or, most recently, a fair-sized octopus. At high tide, and if the wind permits, I kayak out to the still, sheltered spots in the mangrove islands where I know I can find little sharks, two to three feet long, to keep me company. In the evening, after watching the sun set, I have my white wine and grill some local grouper or mahi-mahi. All this may sound unenviably solitary, but do not imagine that I am alone.

The expansive panorama of turquoise water and mangrove islands seen from the dock sold the author on her Sugarloaf Key home.

BARBARA EHRENREICH's *most recent book is* This Land Is Their Land: Reports From a Divided Nation.

Read more contributions to My Kind of Town at Smithsonian.com/mykindoftown



"I had been feeling fine. But turns out my cholesterol and other risk factors* increased my chance of a heart attack. Now I trust my heart to Lipitor. Talk to your doctor about your risk and about Lipitor."

- **Adding Lipitor may help, when diet and exercise are not enough. Unlike some other cholesterol-lowering medications, Lipitor is FDA-approved to reduce the risk of heart attack and stroke in patients with several common risk factors, including family history, high blood pressure, low good cholesterol, age and smoking.**
- **Lipitor has been extensively studied with over 16 years of research. And Lipitor is backed by 400 ongoing or completed clinical studies.**

*Patient's risk factors include age, gender, smoking, and high blood pressure.

IMPORTANT INFORMATION: LIPITOR is a prescription drug. It is used in patients with multiple risk factors for heart disease such as family history, high blood pressure, age, low HDL ('good' cholesterol) or smoking to reduce the risk of heart attack, stroke and certain kinds of heart surgeries. When diet and exercise alone are not enough, LIPITOR is used along with a low-fat diet and exercise to lower cholesterol.

LIPITOR is not for everyone. It is not for those with liver problems. And it is not for women who are nursing, pregnant or may become pregnant. If you take LIPITOR, tell your doctor if you feel any new muscle pain or weakness. This could be a sign of rare but serious muscle side effects. Tell your doctor about all medications you take. This may help avoid serious drug interactions. Your doctor should do blood tests to check your liver function before and during treatment and may adjust your dose. The most common side effects are gas, constipation, stomach pain and heartburn. They tend to be mild and often go away.

LIPITOR is one of many cholesterol-lowering treatment options that you and your doctor can consider.

Please see additional important information on next page.

LIPITOR®
atorvastatin calcium
tablets

Have a heart to heart with your doctor about your risk. And about Lipitor.
Call 1-888-LIPITOR (1-888-547-4867) or visit www.lipitor.com/steve

You are encouraged to report negative side effects of prescription drugs to the FDA.
Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

© 2009 Pfizer Inc. All rights reserved. LPU00643KA

IMPORTANT FACTS

LIPITOR atorvastatin calcium tablets (LIP-ih-tore)

LOWERING YOUR HIGH CHOLESTEROL

High cholesterol is more than just a number, it's a risk factor that should not be ignored. If your doctor said you have high cholesterol, you may be at an increased risk for heart attack. But the good news is, you can take steps to lower your cholesterol.

With the help of your doctor and a cholesterol-lowering medicine like LIPITOR, along with diet and exercise, you could be on your way to lowering your cholesterol.

Ready to start eating right and exercising more? Talk to your doctor and visit the American Heart Association at www.americanheart.org.

WHO IS LIPITOR FOR?

Who can take LIPITOR:

- People who cannot lower their cholesterol enough with diet and exercise
- Adults and children over 10

Who should NOT take LIPITOR:

- Women who are pregnant, may be pregnant, or may become pregnant. LIPITOR may harm your unborn baby. If you become pregnant, stop LIPITOR and call your doctor right away.
- Women who are breast-feeding. LIPITOR can pass into your breast milk and may harm your baby.
- People with liver problems
- People allergic to anything in LIPITOR

BEFORE YOU START LIPITOR

Tell your doctor:

- About all medications you take, including prescriptions, over-the-counter medications, vitamins, and herbal supplements
- If you have muscle aches or weakness
- If you drink more than 2 alcoholic drinks a day
- If you have diabetes or kidney problems
- If you have a thyroid problem

ABOUT LIPITOR

LIPITOR is a prescription medicine. Along with diet and exercise, it lowers "bad" cholesterol in your blood. It can also raise "good" cholesterol (HDL-C).

LIPITOR can lower the risk of heart attack or stroke in patients who have risk factors for heart disease such as:

- age, smoking, high blood pressure, low HDL-C, heart disease in the family, *or*
- diabetes with risk factor such as eye problems, kidney problems, smoking, or high blood pressure

POSSIBLE SIDE EFFECTS OF LIPITOR

Serious side effects in a small number of people:

- **Muscle problems** that can lead to kidney problems, including kidney failure. Your chance for muscle problems is higher if you take certain other medicines with LIPITOR.
- **Liver problems**. Your doctor may do blood tests to check your liver before you start LIPITOR and while you are taking it.

Symptoms of muscle or liver problems include:

- Unexplained muscle weakness or pain, especially if you have a fever or feel very tired
- Nausea, vomiting, or stomach pain
- Brown or dark-colored urine
- Feeling more tired than usual
- Your skin and the whites of your eyes turn yellow

If you have these symptoms, call your doctor right away.

The most common side effects of LIPITOR are:

- Headache
- Diarrhea, gas
- Rash
- Constipation
- Upset stomach and stomach pain
- Muscle and joint pain

Side effects are usually mild and may go away by themselves. Fewer than 3 people out of 100 stopped taking LIPITOR because of side effects.

HOW TO TAKE LIPITOR

Do:

- Take LIPITOR as prescribed by your doctor.
- Try to eat heart-healthy foods while you take LIPITOR.
- Take LIPITOR at any time of day, with or without food.
- If you miss a dose, take it as soon as you remember. But if it has been more than 12 hours since your missed dose, wait. Take the next dose at your regular time.

Don't:

- Do not change or stop your dose before talking to your doctor.
- Do not start new medicines before talking to your doctor.
- Do not give your LIPITOR to other people. It may harm them even if your problems are the same.
- Do not break the tablet.

NEED MORE INFORMATION?

- Ask your doctor or health care provider.
- Talk to your pharmacist.
- Go to **www.lipitor.com** or call **1-888-LIPITOR**.

Uninsured? Need help paying for Pfizer medicines? Pfizer has programs that can help. Call **1-866-706-2400** or visit **www.PfizerHelpfulAnswers.com.**

Pfizer helpful answers®

Manufactured by Pfizer Ireland Pharmaceuticals, Dublin, Ireland
© 2005 Pfizer Ireland Pharmaceuticals All rights reserved.
Printed in the USA.

Distributed by Parke-Davis, Division of Pfizer Inc.
New York, NY 10017 USA
LPIF Rev 2, Dec 2005

Rx only

Around the Mall

SCENES AND SIGHTINGS FROM THE SMITHSONIAN MUSEUMS AND BEYOND

JOHN LONGINO / MINDEN PICTURES

"I bounce around a lot," says Moffett, who has photographed specimens on six continents.

BIOLOGIST AND AWARD-WINNING PHOTOGRAPHER MARK MOFFETT WILL GO TO ANY LENGTHS TO STUDY THE HIDDEN WORLD OF ANTS PAGE 28

CAMERA BUG

From the Castle p. 26
Q&A: Jean Shin p. 31
The Object at Hand p. 30
What's Up p. 33

FROM THE CASTLE

Forever Yours

G. WAYNE CLOUGH

IN 1920, THE BOSTON RED SOX sold Babe Ruth, their best player, to the New York Yankees, thus incurring the notorious "Curse of the Bambino." The Yankees went on to win 26 World Series, the Red Sox none. Until 2004, that is, when the Red Sox swept the Series in four games. This past April, I joined Brent Glass, director of the National Museum of American History, and 100 ardent (Is there any other kind?) Red Sox fans to accept a base used in the '04 Series and a jersey worn by Jon Lester, who conquered lymphoma to pitch the game that clinched the 2007 World Series for the Red Sox. Glass explained that the "Smithsonian is in the 'forever' business," and that such artifacts recognize our nation's abiding love of the game. Baseball is more than just a sport; its rich history mirrors civil rights achievements, triumph over adversity and other proud themes in our heritage.

"Forever" institutions such as libraries, universities and museums are especially important in uncertain times because they provide stability and continuity; they are at their best when they maintain their core values even as they face new challenges. For the Smithsonian, this means adjusting to recent financial downturns, younger generations' changing habits and new communications and networking tools.

The National Museum of African American History and Culture (concept model) will "sing for all of us."

Our buildings are also in the forever business. In April we announced the selection of Freelon Adjaye Bond/SmithGroup as the architectural team (four collaborating firms) to design the National Museum of African American History and Culture (NMAAHC). As the museum's founding director Lonnie Bunch III remarked, this building will "sing for all of us." David Adjaye, a Tanzanian-born architect who is the lead designer, observed that the building celebrates "an incredible journey." It features a large bronze-layered "corona," or crown, on top of a stone porch—a powerful space inviting visitors to experience the African-American story and its messages about justice, resiliency, spirituality and creativity.

Team member J. Max Bond Jr., a highly distinguished African-American architect, died in February; continuing his firm's work on the team will be Peter D. Cook, a great-grandnephew of Julian Abele, a pioneering but under-recognized African-American architect who designed Harvard's Widener Library and much of Duke University. (An article about Abele appeared in the February 2005 issue of SMITHSONIAN: www.smithsonianmag.com/history-archaeology/shadow.html.) The NMAAHC is already collecting artifacts and offering programs (see nmaahc.si.edu/); its building, our newest museum, will open in 2015 adjacent to the Washington Monument. Seeing its spectacular design has been one of the highlights of my first year as Secretary.

G. WAYNE CLOUGH *is Secretary of the Smithsonian Institution.*

Smithsonian Institution

SECRETARY

G. Wayne Clough

BOARD OF REGENTS

CHANCELLOR

The Chief Justice of the United States

CHAIR

Patricia Q. Stonesifer

VICE CHAIR

Alan G. Spoon

MEMBERS

Vice President of the United States, Joseph R. Biden, Jr.

Hon. Thad Cochran
Hon. Christopher J. Dodd
Hon. Patrick J. Leahy
Hon. Xavier Becerra
Hon. Sam Johnson
Hon. Doris Matsui
Dr. Phillip Frost
Dr. Shirley Ann Jackson
Mr. Robert P. Kogod
Mr. John W. McCarter, Jr.
Mr. David M. Rubenstein
Mr. Roger W. Sant

SMITHSONIAN NATIONAL BOARD

Mr. L. Hardwick Caldwell III, CHAIR
Mrs. Peggy P. Burnet, VICE CHAIR
Mr. Paul Neely, VICE CHAIR

NATIONAL BOARD: Ms. Valerie Anders, Ms. Judy Hart Angelo, Mrs. Jane Lipton Cafritz, Mr. Thomas H. Castro, Mr. Wilmer S. Cody, Ms. Abby Joseph Cohen, Mr. James F. Dicke II, Mr. John G.B. Ellison, Jr., Ms. Sakurako D. Fisher, Mr. Michael R. Francis, Mr. Bradford M. Freeman, Mr. John French III, Mrs. Shelby M. Gans, Mr. Richard W. Herbst, Mr. Robert F. Higgins, Mr. Steven G. Hoch, Mrs. Judy S. Huret, Ms. Anne B. Keiser,* Mrs. Betsy Lawer, Mr. Robert E. Long, Jr., Mr. Robert D. MacDonald, Mrs. Dorothy S. McAuliffe, Mr. Chris E. McNeil, Jr., Mr. Gary B. Moore, Mr. Russell E. Palmer, Jr., Mr. William M. Ragland, Jr., Mrs. Kristin Richardson, Hon. Ronald A. Rosenfeld, Mrs. Theiline P. Scheumann, Mrs. Marna Schnabel, Mr. Douglas C. Walker, Mr. Mallory Walker

HONORARY MEMBERS: Mr. Robert McC. Adams, Mr. William S. Anderson, Hon. Max N. Berry, Mr. Richard P. Cooley, Mr. Frank A. Daniels, Jr., Mr. Charles D. Dickey, Jr., Mrs. Patricia Frost, Mr. I. Michael Heyman, Mr. James M. Kemper, Jr., Mrs. Jean B. Mahoney, Justice Sandra Day O'Connor, Mr. Francis C. Rooney, Jr., Mr. Wilbur L. Ross, Jr., Mr. Lloyd G. Schermer, Hon. Frank A. Weil, Mrs. Gay F. Wray

* Ex-Officio

JOHN BARRAT, SI

Create your own power trip at **washington.org**

Inspiring vacation values with dozens of free attractions and Staying Power weekend packages.
Stay in the heart of the city ★ Make it a 3-night weekend ★ Save 30% off your entire stay ★ Starting at $107/night

WASHINGTON DC™

Paid for by Destination DC

ANT EYE VIEW

A NEW PHOTO EXHIBIT AT THE NATURAL HISTORY MUSEUM REMINDS US THAT WE STILL LIVE IN AN AGE OF DISCOVERY

"My parents say that I've looked at ants since I was in diapers," says Moffett (above: with another of his interests, a tarantula).

"THE AFRICAN ONES have jaws like knives; they'll eat babies." The listener squirms. Next image. A grime-covered hunter is attacking its prey. "This one, you can just lean back in your chair with a beer to watch."

Mark Moffett, 51, tilts his head when he speaks. The biologist is accustomed to the angle; he spends a lot of time on the ground, photographing the minutiae of nature, especially ant life, in vivid, almost glamorous detail—a skill he acquired largely by reading a how-to book on fashion photography when he was a 24-year-old grad student.

"Turned out I was pretty good at it," he says—an understatement, given that he's won several prestigious photojournalism awards. Dressed in rumpled attire, he is sprawled in a leather armchair with a laptop computer at the Explorers Club on New York City's Upper East Side. (Previous club members have included explorers Robert Peary and Sir Edmund Hillary.) Moffett glances around at the strange assortment of trophy tusks and dusty stuffed beasts. "This is the sort of place you'd expect to find a lot of old men smoking pipes," he says.

Still, if the décor doesn't suit Moffett, the club's adventurous spirit certainly does. "I'm kind of an ant elitist," he says. "I like to travel to find the best ants, which are mostly in the tropics." In pursuit of that and other goals relating to the study of exotic life, he has spent the past 30 years conducting research and photographing specimens on six continents, where he's survived close encounters with stampeding elephants and climbed some of the world's tallest trees to study forest canopies.

But it's the ants, not the close calls or tall tales, that seem to provoke the most excitement among Moffett's colleagues in the scientific community. "We tend to think of the 19th century as the end of the great age of discovery," says Smithsonian entomologist Ted Schultz. "But the age of discovery continues unabated when it comes to insect species." Schultz coordinated a new exhibition featuring Moffett's photographs at the National Museum of Natural History, "Farmers, Warriors, Builders: The Hidden Life of Ants," which runs through October 10.

Not bad for a high-school dropout from Salida, Colorado, and later, Beloit, Wisconsin. Moffett spent his teen years hanging out with science professors at Beloit College, who made an exception for his lack of a diploma and allowed him to earn his undergraduate degree. (Last year his high school awarded him an honorary diploma.) He got his doctorate studying Asian ants at Harvard, where he found a mentor in the eminent evolutionary biologist (and ant expert) Edward O. Wilson. He also worked there briefly as a curator of ants—perhaps the only thing on Moffett's lengthy résumé that could be considered an ac-

{ CONTINUED ON PAGE 31 }

Miniature portraits (clockwise): an Australian bull dog ant tends larvae; a Panamanian army ant defends its turf; an ant in Borneo searches for leftovers on an insect-eating pitcher plant.

MINDEN PICTURES; MARK MOFFETT / MINDEN PICTURES (3)

See more of Mark Moffett's ants and antics at Smithsonian.com/moffett

ADVERTISEMENT

Imagine examining artifacts in the Smithsonian Institution and finding a never-before-seen sketch for the largest and highest denomination American coin ever proposed? That's just what happened as one coin expert recently explored the collection at this celebrated public institution. But as this numismatist discovered, it has more to share than he could ever imagine.

Discovered...Historic Coin Design!

America's Lost Masterpiece

THE $100 UNION™

Original sketches found at the Smithsonian

To his own surprise, he had found the original design concept for a hundred dollar denomination created by George T. Morgan, arguably the greatest American coin designer. These sketches, hidden within an original sketchbook for nearly a century, represent perhaps the grandest American coin ever proposed—the $100 Union.

George T. Morgan will always be remembered for his most famous coin—the Morgan silver dollar. Until recently, the world knew nothing of Morgan's larger sized and higher denomination $100 Union concept design.

The secret's out! For a limited time, you can secure the world's first and only $100 Union Proof struck in pure .999 Silver at our special price of only $99 (plus S&H). CALL TODAY!

Call now to secure your reservation for this exceptional collector's treasure!

$100 Union™ Silver Proof
Only $99

This is not a reproduction...this is the first time ever Morgan's $100 Union™ design has been struck as a silver proof.

Smithsonian Institution®

A portion of the sales proceeds from your purchase of this licensed product supports the chartered educational purposes of the National Numismatic Collection, housed in the Smithsonian's National Museum of American History.

1-800-642-9160 ext. 4399

New York Mint, 5577 West 78th Street, Edina, MN

©2009 New York Mint, Ltd. New York Mint is a private company and is not affiliated with the United States Mint. This Silver Proof is not legal tender and the U.S. Mint has not endorsed it nor the New York Mint.

THE OBJECT AT HAND

Reconnaissance Flyer

NATIONAL AIR AND SPACE MUSEUM/UDVAR-HAZY CENTER

STEALTH MACHINE

The SR-71 was the ultimate spy plane

BY OWEN EDWARDS

IN THE NEW SCI-FI MOVIE *Transformers: Revenge of the Fallen*, an airplane on display at the Smithsonian's Udvar-Hazy Center in Chantilly, Virginia, gets a star turn. The real-life reconnaissance plane, an SR-71 Blackbird, is the basis for the character Jetfire, a souped-up superplane brought to life by the film's animators. (The *Transformers* franchise recounts a series of epic battles between two factions of alien robots who disguise themselves by morphing into machines.)

Of course, the actual SR-71 Blackbird had transformed manned flight long before special-effects animators saw its potential. Created as the ultimate spy plane, the SR-71, which first took to the air in December 1964, flew reconnaissance missions until 1990, capable of hurtling along at more than Mach 3, about 2,280 miles per hour—faster than a rifle bullet—at 85,000 feet, or 16 miles above the earth. It is the fastest jet-powered airplane ever built. At top speeds, the surface heat of the airframe could reach 900 degrees Fahrenheit. In their pressurized suits and breathing pure oxygen—mandated by the extreme altitude—the two-man crew looked like astronauts.

Brian Shul, one of fewer than a hundred pilots who flew the plane on recon missions from Beale Air Force base in California as well as bases in England and Japan, calls the SR-71 simply "the most remarkable airplane of the 20th century. We'll never see a plane like that again."

The Udvar-Hazy Blackbird, identified by its tail number, 61-7972, holds several records, including: New York to London in 1 hour 54 minutes 56.4 seconds. (Another Blackbird, 61-7958, set the record for average jet speed: 2,193.167 mph.) On March 6, 1990, as it made its final flight, the Smithsonian plane set another record—Los Angeles to Dulles International Airport, outside Washington, D.C., in 1 hour 4 minutes 20 seconds (barely time for a snack and a snooze). That day, a team including Air Force Lt. Col. Ed Yeilding and Lt. Col. Joseph Vida touched the plane down at Dulles for delivery to Udvar-Hazy, the National Air and Space Museum's companion facility.

I asked Shul, a former Air Force fighter pilot and Vietnam veteran who has written two books about the Blackbird—one recounting his reconnaissance for a dramatic raid on Libya in 1986—what it was like to fly such a phenomenal craft. "It wasn't like any other airplane," he told me. "It was terrifying, exciting, intense and humbling every time you flew. Each mission was designed to fly at a certain speed; you

Former Air Force pilot Brian Shul calls the super-fast SR-71 Blackbird "the most remarkable airplane of the 20th century."

DANE PENLAND / NASM, SI

See more SR-71 images at Smithsonian.com/sr-71

always knew the airplane had more. It was like driving to work in a double-A fuel dragster."

A team of engineers and designers at a southern California unit of Lockheed, headed by legendary aeronautical designer Clarence "Kelly" Johnson and his eventual successor, Benjamin Rich, created the SR-71. To deal with airframe heat at Mach 3 and to reduce weight, the SR-71's skin is 85 percent titanium and 15 percent carbon composites. Ironically—because the spy plane was a creature of the cold war—its titanium was purchased from the Soviet Union, although the use to which it would be put remained a closely guarded secret.

The unarmed Blackbird depended on its speed and altitude for defense and on a high degree of invisibility. The plane's distinctive flat profile, with a sharp edge, or chine, running the length of the fuselage, presented very little surface to be detected by radar. Its features anticipated the F-117A stealth fighter, developed at the same Lockheed unit. The SR-71's unusual silhouette caused workers at a U.S. base in Okinawa, Japan, to refer to the plane as the *habu*—a poisonous black snake indigenous to the island. Crews dubbed the plane the "sled"; SR-71 enthusiasts call themselves "Sledheads."

Achieving Mach 3 performance is expensive. The 32 Blackbirds cost an average of $34 million each. Of the billion-dollar SR-71 fleet, 12 were in accidents, but none was shot down by hostile action. Only one crew member was killed, in a mishap that occurred during a midair refueling. "We knew," says Shul of his fellow Blackbird pilots, "that we were flying a piece of history."

And history the planes have become. However advanced they were, time and technology overtook them; in 1990, as satellites appropriated their mission, operational flights ended. Today's unmanned orbital droids may represent the state of the art. But compared with the Blackbird, they are hardly art at all.

OWEN EDWARDS *is a freelance writer and author of the book* Elegant Solutions.

Q&A

JEAN SHIN creates sculptures from castaway objects such as old lottery tickets and broken umbrellas. Megan Gambino spoke to her about her new show at the Smithsonian American Art Museum, "Jean Shin: Common Threads."

HOW DID THIS IDEA BEGIN? I'm always attracted to objects that have the potential to be reimagined differently from their current use or value in our society. I collected cuffs from my own pants, which I have to typically roll up about two and a half inches or cut off. In a way, the accumulation of cuffs over the years mapped my own body.

SOMEONE'S TRASH IS ANOTHER'S TREASURE? Yeah, it's funny. That statement makes it seem like it's literally trash. But these castaway objects are sometimes things that people hold onto throughout their lives and have a hard time parting with, like trophies.

YOU COLLECTED 2,000 TROPHIES IN AND AROUND WASHINGTON, D.C. The project [*Everyday Monuments*] grew out of my interest in Washington as a city planned around monuments. I wanted to choose a symbolic, everyday object that was a modest version of public monuments.

YOUR INSTALLATIONS ARE SOMETIMES DESCRIBED AS GROUP PORTRAITS. I see every object as a part of that person's identity and personal history. Someone asked me why I didn't just buy 2,000 trophies, and that would have been a lot easier. But it really wouldn't have embodied people's lives.

Read more of our interview with Jean Shin at Smithsonian.com/shin

{ CONTINUED FROM PAGE 28 }

tual job. "I'm not very good at this reality thing," he says. "But you don't have to sit in a lab with a white coat clicking away at a machine all day to be a biologist."

Sometimes, apparently, you don't need to wear clothes at all. Moffett's Web site, DoctorBugs.com, includes photographs and a video of his 2008 marriage to Melissa Wells atop an Easter Island volcano, for which the couple wore little more than paint and feathers. And he doesn't shy away from childish stunts, such as spooking television talk-show host Conan O'Brien with a large spider.

An Ecuadorean ant prepares to crush a grasshopper in its traplike mandibles.

But Moffett is unapologetic. "Scientists should be better storytellers, and humor is a big part of that," he says. "If you can get people to understand and relate to one spider, for example, then they will understand spiders generally, and get excited about saving them."

His mentor would likely agree. E. O. Wilson calls Moffett "a rare born naturalist" and says he "knew he was something special" from the start. But Wilson declines to revel in his former student's success. "Mark is Mark," Wilson reflects. "He just developed on his own." AMANDA BENSEN

DIANA PAU / SAAM; KEN RAHAIM, SI; MARK MOFFETT / MINDEN PICTURES

ADVERTISEMENT

SATURDAY,
SEPTEMBER 26TH

5TH ANNUAL

Smithsonian magazine

museumday

ENJOY FREE MUSEUM ADMISSION

at hundreds of participating museums and cultural venues nationwide.

LOOK FOR MORE DETAILS,

a list of participating locations, and your Museum Day Admission Card in the September issue of *Smithsonian* magazine or visit: **www.Smithsonian.com/MuseumDay**

- If you are a museum that would like more information on participating in this year's Museum Day, log onto: **www.Smithsonian.com/MuseumDay/museums**

WWW.SMITHSONIAN.COM/MUSEUMDAY

Supporting Sponsor:

CITGO®
HERE AT EVERY TURN.

What's Up

SPECIAL DELIVERY

During the Great Depression, FDR changed the look of stamps to convey messages of optimism (left: a stamp sketched and signed by the 32nd president). Learn more at the National Postal Museum exhibit "Delivering Hope," through June 6, 2010.

ABOUT FACE

Artist Shahzia Sikander guest-curates at the Cooper-Hewitt, National Design Museum in New York City. Her selections, on exhibit through September 7, emphasize identity and portraiture (right: German medical illustrations from 1910).

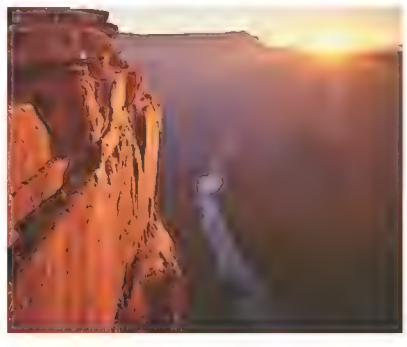
IN THE MONEY

Short on cash? Then visit the National Museum of American History's new exhibition "Stories on Money," which looks at how U.S. currency has changed from Colonial times through today. (left: a 50-dollar coin from 1851).

GRAND IMAGERY

See the traveling exhibit "Lasting Light: 125 Years of Grand Canyon Photography" (right: 1987) at the Teton County Library in Jackson, Wyoming, through July 19.

BY JOSEPH CAPUTO



IN A GALAXY FAR, FAR AWAY . . .

Some artists paint portraits; Wang Ming prefers to paint the universe. His abstract space art (above: *Cosmic Butterfly*, 1973) will be displayed at the National Air and Space Museum through October 9.

VISIT THE SMITHSONIAN For a free Associates' planning packet, call 202 633-1000 or 202 357-1729 (TTY), 9 a.m. to 5 p.m. Monday through Friday and 9 a.m. to 4 p.m. Saturday. Or send an e-mail to info@si.edu. The Smithsonian Information Center in the Castle is open daily, 8:30 a.m. to 5:30 p.m. Members can visit the reception desk between 9 a.m. and 4 p.m. to register for a behind-the-scenes tour and to hear about membership benefits. Most museums are open daily, 10 a.m. to 5:30 p.m. All museums are closed December 25.

Get an insider's look at the Smithsonian at Smithsonian.com/mallblog

NATIONAL POSTAL MUSEUM, SI; NASM, SI; MATT FLYNN / COOPER-HEWITT NATIONAL DESIGN MUSEUM, SI; NMAH, SI; JACK DYKINGA / SITES

Smithsonian
JULY 2009 · VOLUME 40 · NUMBER 4

The 1974 discovery of buried vaults at Xi'an filled with thousands of terra cotta warriors stunned the world (the figures *in situ* today). Emperor Qin Shi Huangdi's vast third-century B.C. necropolis, says British art historian Jane Portal, constitutes "arguably the most famous archaeological site on earth."

ON THE MARCH

A traveling exhibition of China's 2,200-year-old terra cotta soldiers sheds new light on the ruler whose tomb they guarded

BY ARTHUR LUBOW

In March 1974, a group of peasants

digging a well in drought-parched Shaanxi province in northwest China unearthed fragments of a clay figure—the first evidence of what would turn out to be one of the greatest archaeological discoveries of modern times. Near the unexcavated tomb of Qin Shi Huangdi—who had proclaimed himself first emperor of China in 221 B.C.—lay an extraordinary underground treasure: an entire army of life-size terra cotta soldiers and horses, interred for more than 2,000 years.

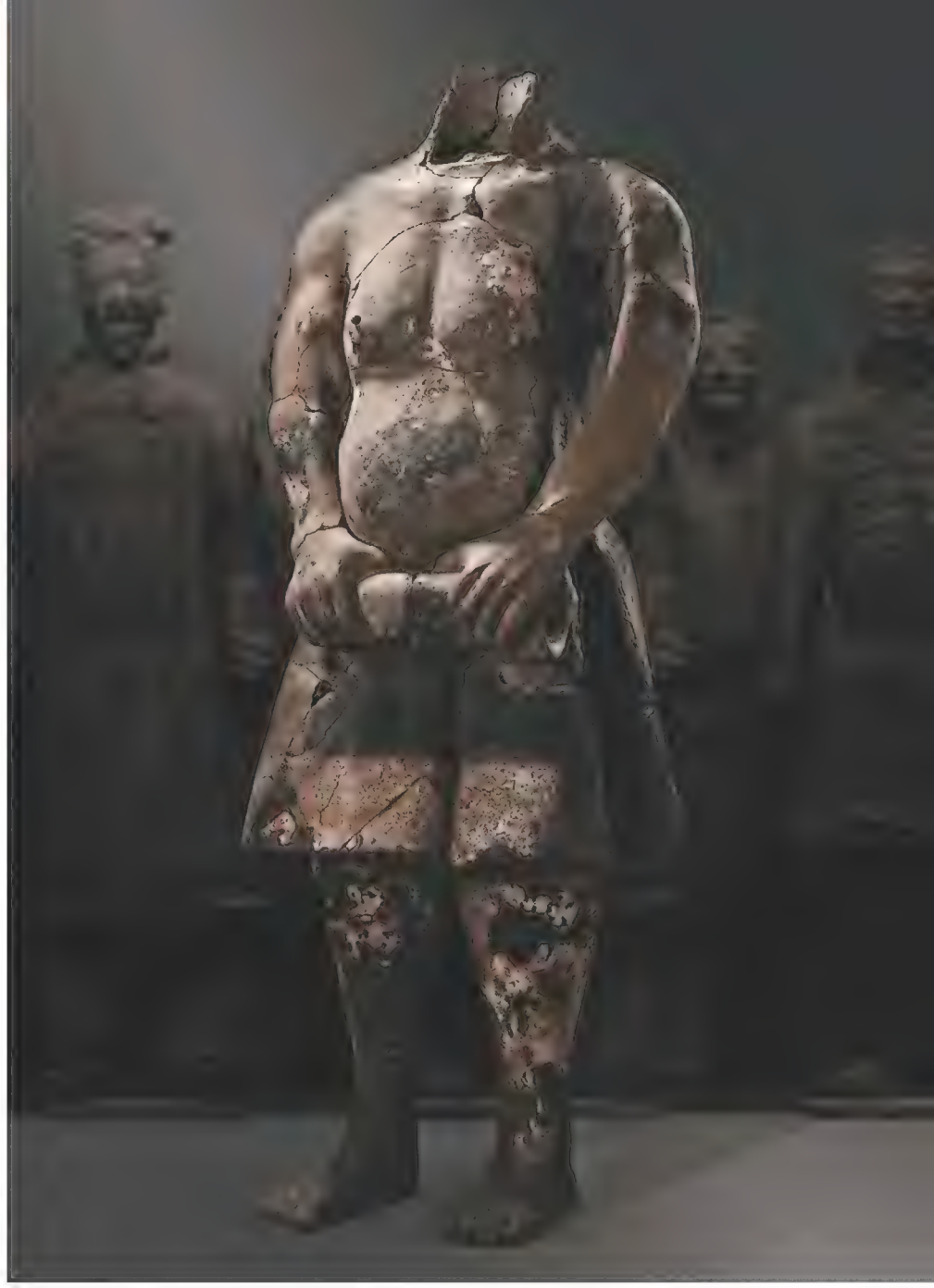
The site, where Qin Shi Huangdi's ancient capital of Xianyang once stood, lies a half-hour drive from traffic-clogged Xi'an (pop. 8.5 million). It is a dry, scrubby land planted in persimmon and pomegranate—bitterly cold in winter and scorching hot in summer—marked by dun-colored hills pocked with caves. But hotels and a roadside souvenir emporium selling five-foot-tall pottery figures suggest that something other than fruit cultivation is going on here.

Over the past 35 years, archaeologists have located some 600 pits, a complex of underground vaults as yet largely unexcavated, across a 22-square-mile area. Some are hard to get to, but three major pits are easily accessible, enclosed inside the four-acre Museum of the Terracotta Army, constructed around the discovery site and opened in 1979. In one pit, long columns of warriors, reassembled from broken pieces, stand in formation. With their topknots or caps, their tunics or armored vests, their goatees or close-cropped beards, the soldiers exhibit an astonishing individuality. A second pit inside the museum demonstrates how they appeared when they were found: some stand upright, buried to their shoulders in soil, while others lie toppled on their backs, alongside fallen and cracked clay horses. The site ranks with the Great Wall and Beijing's Forbidden City as one of the premier tourist attractions within China.

For those unable to make the journey to Xi'an, some of the choicest specimens unearthed there form the centerpiece of two successive traveling exhibitions that survey the reign of Qin Shi Huangdi (221 B.C.-210 B.C.). "The First Emperor," organized by the British Museum, debuted in London before moving to the High Museum in Atlanta. A second show, "Terra Cotta Warriors," then opened at the Bowers Museum in Santa Ana, California. It is now at the Houston Museum of Natural Science through October 18, and then moves to the National Geographic Society Museum in Washington, D.C. for display from November 19 to March 31, 2010.

For museumgoers (right center: attending the show at London's British Museum), the exhibitions offer a rare glimpse of Xi'an's treasures (clockwise from top left: court official, kneeling archer, acrobat-troupe strongman, cavalry horse, bronze crane). The excavations reveal a dazzling range of artifacts, painting a detailed portrait of a China newly unified in the third century B.C. According to Chinese archaeologist Duan Qingbo, the figures represent "an imitation of the real organization of the Qin dynasty."

WANG DA-GANG / HOUSTON MUSEUM OF NATURAL SCIENCE (3); WPN / UPPA / PHOTOSHOT; WANG DA-GANG / HOUSTON MUSEUM OF NATURAL SCIENCE (2); PP. 34-35 O. LOUIS MAZZATENTA



Historians are revising long-standing assessments of Qin Shi Huangdi (top right: a 1700s engraving) as a cruel warmonger whose atrocities are said to have included executing scholars (top left) and burning books (bottom left). In fact, the emperor introduced significant advances, including a standardized currency (bottom right: a coin unearthed at Xi'an) and a civil administration system.

In addition to showcasing recent finds, the exhibitions feature the largest collection of terra cotta figures ever to leave China. The statuary includes nine soldiers arranged in battle formation (armored officers, infantrymen, and standing and kneeling archers), as well as a terra cotta horse. Another highlight is a pair of intricately detailed, ten-foot-long bronze chariots, each drawn by four bronze horses. (Too fragile to be transported, the chariots are represented by replicas.) The artifacts offer a glimpse of the treasures that attract visitors from around the world to the Xi'an museum site, where 1,900 of an estimated 7,000 warriors have been disinterred so far.

THE STUPENDOUS FIND at first seemed to reinforce conventional thinking—that the first emperor had been a relentless warmonger who cared only for military might. As archaeologists have learned during the past decade, however, that assessment was incomplete. Qin Shi Huangdi may have conquered China with his army, but he held it together with a civil administration system that endured for centuries. Among other accomplishments, the emperor standardized weights and measures and introduced a uniform writing script.

Recent digs have revealed that in addition to the clay soldiers, Qin Shi Huangdi's underground realm, presumably a facsimile of the court that surrounded him during his lifetime, is also populated by delightfully realistic waterfowl, crafted from bronze and serenaded by terra cotta musicians. The emperor's clay retinue includes terra cotta officials and even troupes of acrobats, slightly smaller than the soldiers but created with the same methods. "We find the underground pits are an imitation of the real organization in the Qin dynasty," says Duan Qingbo, head of the excavation team at the Shaanxi Provincial Research Institute for Archaeology. "People thought when the emperor died, he took just a lot of pottery army soldiers with him. Now they realize he took a whole political system with him."

Qin Shi Huangdi decreed a mass-production approach; artisans turned out figures almost like cars on an assembly line. Clay, unlike bronze, lends itself to quick and cheap fabrication. Workers built bodies, then customized them with heads, hats, shoes, mustaches, ears and so on, made in small molds. Some of the figures appear so strikingly individual they seem modeled on real people, though that is unlikely. "These probably weren't portraits in the Western sense," says Hiromi Kinoshita, who helped curate the exhibition at the British Museum. Instead, they may have been aggregate portraits: the ceramicists, says Kinoshita, "could have been told that you need to represent all the different types of people who come from different regions of China."

The first emperor's capital, Xianyang, was a large metropolis, where he reportedly erected more than 270 palaces, of which only a single foundation is known to survive. Each time Qin Shi Huangdi conquered a rival state, he is said to have transported its ruling families to Xianyang, housing the vanquished in replicas of palaces they had left behind. At the same time, the emperor directed construction of his tomb complex; some 720,000 workers reportedly labored on these vast projects.

UPON THE DEATH OF HIS FATHER, Yiren, in 246 B.C., the future Qin Shi Huangdi—then a prince named Ying Zheng who was around age 13—ascended the throne. The kingdom, celebrated for its horsemen, sat on the margin of civilization, regarded by its easterly rivals as a semi-savage wasteland. Its governing philosophy was as harsh as its terrain. Elsewhere in China, Confucianism held that a well-run state should be administered by the same precepts governing a family: mutual obligation and respect. Qin rulers,

When the trove was first unearthed, figures lay shattered (right, clockwise from top right: the site in 1975, a warrior sheathed in stone-tile armor, a conservator restoring the emperor's retinue, and a partially excavated figure). Despite what appears to be each statue's haunting individuality, "these probably weren't portraits in the Western sense," says art historian Hiromi Kinoshita, who adds that the figures could depict "different types of people who came from different regions of China."

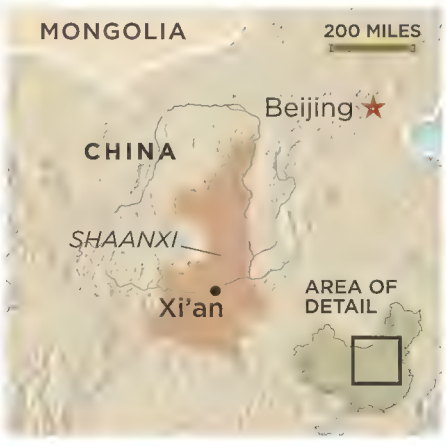
BIBLIOTHEQUE NATIONALE, PARIS / ART ARCHIVE; GRANGER COLLECTION, NEW YORK; MARY EVANS PICTURE LIBRARY; ERICH LESSING / ART RESOURCE, NY; P. 39 FRANK LUKASSECK / CORBIS; AP IMAGES; O. LOUIS MAZZATENTA (2)

however, subscribed to a doctrine known as legalism, which rested on the administration of punitive laws.

In his early 20s, Ying Zheng turned for guidance to a visionary statesman, Li Si, who likely initiated many of his sovereign's accomplishments. Under Li's tutelage, Ying Zheng introduced a uniform script (thereby enabling subjects of vastly different dialects to communicate). Standardization, a hallmark of the Qin state, was applied to weaponry as well: should an arrow shaft snap, or the trigger on a repeating crossbow malfunction, the component could be easily replaced. The young ruler also presided over creation of an advanced agricultural infrastructure that incorporated irrigation canals and storage granaries.

With methodical zeal, Ying Zheng set about conquering the warring states that surrounded him in the late third century B.C. As his armies advanced, principalities fell. No one could thwart consolidation of an empire that eventually stretched from parts of present-day Sichuan in the west to coastal regions along the East China Sea. Having unified

In Xi'an, where an arched roof (right) was constructed over the discovery site, 1.3 million visitors flock annually to view the figures (below, clockwise from top left: statuettes are produced at a nearby souvenir factory; map; archaeologist Duan Qingbo, head of the excavation team; the museum exterior). The site is testament to ceaseless labor on the part of Qin Shi Huangdi's subjects: "No ruler on the Asian continent had ever demanded such an ostentatious display of funereal megalomania," writes archaeologist Lukas Nickel.



TIM GRAHAM / GETTY IMAGES; MAP: GUILBERT GATES; AGE FOTOSTOCK; FREDERIC J. BROWN / AFP / GETTY IMAGES

the entire civilized world as he knew it, Ying Zheng in 221 B.C. renamed himself Qin Shi Huangdi, translated as First Emperor of Qin.

He then invested in infrastructure and built massive fortifications. His road network likely exceeded 4,000 miles, including 40-foot-wide speedways with a central lane reserved for the imperial family. On the northern frontier, the emperor dispatched his most trusted general to reinforce and connect existing border barriers, creating a bulwark against nomadic marauders. Made of rammed earth and rubble, these fortifications became the basis for the Great Wall, most of which would be rebuilt in stone and brick during the 15th century A.D. under the Ming dynasty.

AS THE GRANDEUR OF HIS TOMB complex suggests, Qin Shi Huangdi kept an eye on posterity. But he also longed to extend his life on earth—perhaps indefinitely. Alchemists informed the emperor that magical herbs were to be found on what they claimed were three Islands of the Immortals in the East China Sea. The emissaries most likely to gain entry to this mystical realm, they asserted, were uncorrupted children; in 219 B.C., Qin Shi Huangdi reportedly dispatched several thousand youngsters to search for the islands. They never returned. Four years later, the emperor

ARTHUR LUBOW, *who reports frequently on culture and the arts around the world, is based in New York City.*

PP. 40-41 JUPITER IMAGES

sent three alchemists to retrieve the herbs. One of them made it back, recounting a tale of a giant fish guarding the islands. Legend has it that the first emperor resolved to lead the next search party himself; on the expedition, the story goes, he used a repeating crossbow to kill a huge fish. But instead of discovering life-preserving elixirs, the emperor contracted a fatal illness.

As he lay dying in 210 B.C., 49-year-old Qin Shi Huangdi decreed that his estranged eldest son, Ying Fusu, should inherit the empire. The choice undercut the ambitions of a powerful royal counselor, Zhao Gao, who believed he could govern the country behind the scenes if a more malleable successor were installed. To conceal Qin Shi Huangdi's death—and disguise the stench of a decomposing corpse—until the travelers returned to the capital, Zhao Gao took on a cargo of salted fish. The delaying tactic worked. Once Zhao Gao managed to return to Xianyang, he was able to operate on his home turf. He managed to transfer power to Ying Huhai, a younger, weaker son.

The emperor's tomb lies undisturbed beneath a forested burial mound (above). Wu Yongqi, director of the Xi'an museum, shares a widely held reluctance to disrupt a ruler, he says, "who has slept here for 2,000 years."

Ultimately, however, the scheme failed. Zhao Gao could not maintain order and the country descended into civil war. The Qin dynasty outlived Qin Shi Huangdi by only four years. The second emperor committed suicide; Zhao Gao eventually was killed. Various rebel forces coalesced into a new dynasty, the Western Han.

For archaeologists, one indicator that Qin rule had collapsed suddenly was the extensive damage to the terra cotta army. As order broke down, marauding forces raided the pits where clay soldiers stood guard and plundered their real weapons. Raging fires, possibly set deliberately, followed the ransacking, weakening support pillars for wooden ceilings, which crashed down and smashed the figures. Some 2,000 years later, archaeologists discovered charring on the walls of one pit.

See more of the terra cotta soldiers at Smithsonian.com/terracotta

THROUGHOUT RECORDED CHINESE HISTORY, the first emperor's Ebang Palace—its site on the Wei River, south of ancient Xianyang, was not investigated until 2003— was synonymous with ostentation. The structure was said to have been the most lavish dwelling ever constructed, with an upper-floor gallery that could seat 10,000 and a network of covered walkways that led to distant mountains to the south.

"All Chinese people who can read, including middle-school students, believed that the Qin dynasty collapsed because it put so much money into the Ebang Palace," says archaeologist Duan. "According to excavation work from 2003, we found it was actually never built—only the base. Above it was nothing." Duan says that if the palace had been erected and demolished, as historians thought, there would be potsherds and telltale changes in soil color. "But tests found nothing," says Duan. "It is so famous a symbol of Chinese culture for so long a time, showing how cruel and greedy the first emperor was—and archaeologists found it was a lie." Duan also doubts accounts of Qin Shi Huangdi's expedition for life-prolonging herbs. His version is more prosaic: "I believe that the first emperor did not want to die. When he was sick, he sent people to find special medicines."

THE EMPEROR'S TOMB LIES beneath a forested hill, surrounded by cultivated fields about a half-mile from the museum. Out of reverence for an imperial resting place and concerns about preserving what might be unearthed there, the site has not been excavated. According to a description written a century after the emperor's death, the tomb contains a wealth of wonders, including man-made streambeds contoured to resemble the Yellow and Yangtze rivers, flowing with shimmering, quicksilver mercury that mimics coursing water. (Analysis of soil in the mound has indeed revealed a high level of mercury.)

Yet answers about the tomb are not likely to emerge anytime soon. "I have a dream that one day science can develop so that we can tell what is here without disturbing the emperor, who has slept here for 2,000 years," says Wu Yongqi, director of the Museum of the Terracotta Army. "I don't think we have good scientific techniques to protect what we find in the underground palace. Especially if we find paper, silk or textiles from plants or animals; it would be very bad if they have been kept in a balanced condition for 2,000 years, but suddenly they would vanish in a very short time." He cites another consideration: "For all Chinese people, he is our ancestor, and for what he did for China, we cannot unearth his tomb just because archaeologists or people doing tourism want to know what is buried there."

Whatever future excavations reveal about Qin Shi Huangdi's enigmatic nature, some things seem unlikely to change. The emperor's importance as a seminal figure of history won't be diminished. And the mysteries that surround his life will likely never be completely resolved.

O. LOUIS MAZZATENTA

Paul Fredrick

YOUR FIT. YOUR STYLE.

Crisp, comfortable white 100% cotton pinpoint oxford dress shirts in **Regular, Big & Tall or Trim Fit** at a

SPECIAL INTRODUCTORY PRICE...

$19.95

Reg. $39.50-$49.50

Plus, FREE monogramming!
(an $8.50 value)

Add this Satin Stripe Necktie for only $19.95!

Item #TFD1550
(Regularly $49.50)

Specify promotional code **T9FSSN**.

New customer offer. Limit four shirts per customer. Shipping charges extra. Cannot be combined with other offers. Expires 8/31/09.

Your Style:
- Straight Collar with Button Cuffs
- Straight Collar with French Cuffs
- Buttondown Collar with Button Cuffs

Your Fit:
- Regular
- Big & Tall
- Trim

Your Size:
- Neck sizes from 14½" to 20"
- Sleeve lengths from 30" to 38"

Order Today! Call **1-800-247-1417** or visit **PaulFredrick.com/try**

The Soviet leader makes his entrance at 20th Century Fox (above) on Sept. 19, 1959. He would call *Can-Can* (opposite) exploitive and pornographic.

Nikita in Tinseltown

When Khrushchev went to Tinseltown at the height of the cold war, the Soviet dictator put on a show of his own

BY PETER CARLSON

FIFTY SUMMERS AGO President Dwight Eisenhower, hoping to resolve a mounting crisis over the fate of Berlin, invited Soviet Premier Nikita Khrushchev to a summit meeting at Camp David. Ike had no idea of what he was about to unleash on the land whose Constitution he had sworn to defend.

It was the height of the cold war, a frightening age of fallout shelters and "duck-and-cover" drills. No Soviet premier had visited the United States before, and most Americans knew little about Khrushchev except that he had jousted with Vice President Richard Nixon in the famous "kitchen debate" in Moscow that July and had uttered, three years before, the ominous-sounding prediction, "We will bury you."

Khrushchev accepted Ike's invitation—and added that he'd also like to travel around the country for a few weeks. Ike, suspicious of the wily dictator, reluctantly agreed.

Reaction to the invitation was mixed, to say the least. Hundreds of Americans bombarded Congress with angry letters and telegrams of protest. But hundreds of other Americans bombarded the Soviet Embassy with friendly pleas that Khrushchev visit their home or their town or their county fair. "If you'd like to enter a float," the chairman of the Minnesota Apple Festival wrote to Khrushchev, "please let us know."

A few days before the premier's scheduled arrival, the Soviets launched a missile that landed on the moon. It was the first successful moonshot, and it caused a massive outbreak of UFO sightings in Southern California. That was only a prelude to a two-week sojourn that historian John Lewis Gaddis would characterize as "a surreal extravaganza."

After weeks of hype—"Khrushchev: Man or Monster?" (*New York Daily News*), "Capital Feverish on Eve of Arrival" (*New York Times*), "Official Nerves to Jangle in Salute to Khrushchev" (*Washington Post*), "Khrushchev to Get Free Dry Cleaning" (*New York Herald Tribune*)—Khrushchev landed at Andrews Air Force base on September 15, 1959. Bald as an egg, he stood only a few inches over five feet but weighed nearly 200 pounds, and he had a round face, bright blue eyes, a mole on his cheek, a gap in his teeth and a potbelly that made him look like a man shoplifting a watermelon. When he stepped off the plane and shook Ike's hand, a woman in the crowd exclaimed, "What a funny little man!"

Things got funnier. As Ike read a welcoming speech, Khrushchev mugged shamelessly. He waved his hat. He

Adapted from *K Blows Top*, by Peter Carlson, published by PublicAffairs, a member of the Perseus Books Group. All rights reserved.

CBS PHOTO ARCHIVE / GETTY IMAGES; P. 45 NAT FARBMAN / TIME LIFE PICTURES / GETTY IMAGES

HOLLYWOOD

winked at a little girl. He theatrically turned his head to watch a butterfly flutter by. He stole the spotlight, one reporter wrote, "with the studied nonchalance of an old vaudeville trouper."

The traveling Khrushchev roadshow had begun.

The next day, he toured a farm in Maryland, where he petted a pig and complained that it was too fat, then grabbed a turkey and griped that it was too small. He also visited the Senate Foreign Relations Committee and advised its members to get used to communism, drawing an analogy with one of his facial features: "The wart is there, and I can't do anything about it."

Early the next morning, the premier took his show to New York City, accompanied by his official tour guide, Henry Cabot Lodge Jr., the United States ambassador to the United Nations. In Manhattan, Khrushchev argued with capitalists, yelled at hecklers, shadowboxed with Gov. Nelson Rockefeller, got stuck in an elevator in the Waldorf-Astoria Hotel and toured the Empire State Building, which failed to impress him.

"If you've seen one skyscraper," he said, "you've seen them all."

And on the fifth day, the cantankerous communist flew to Hollywood. There, things only got weirder.

"See all you can, hear all you can, go all you can," Khrushchev (above: a pre-visit Herblock drawing) once said; he viewed Ike's invitation as "incredible."

TWENTIETH CENTURY FOX had invited Khrushchev to watch the filming of *Can-Can*, a risqué Broadway musical set among the dance hall girls of *fin de siècle* Paris, and he had accepted. It was an astounding feat: a Hollywood studio had persuaded the communist dictator of the world's largest nation to appear in a shameless publicity stunt for a second-rate musical. The studio sweetened the deal by arranging for a luncheon at its elegant commissary, the Café de Paris, where the great dictator could break bread with the biggest stars in Hollywood. But there was a problem: only 400 people could fit into the room, and nearly everybody in Hollywood wanted to be there.

"One of the angriest social free-for-alls in the uninhibited and colorful history of Hollywood is in the making about who is to be at the luncheon," Murray Schumach wrote in the *New York Times*.

The lust for invitations to the Khrushchev lunch was so strong that it overpowered the fear of communism that had reigned in Hollywood since 1947, when the House Committee on Un-American Activities began investigating the movie industry, inspiring a blacklist of supposed communists that was still enforced in 1959. Producers who were scared to death of being seen snacking with a communist screenwriter were desperate to be seen dining with the communist dictator.

A handful of stars—Bing Crosby, Ward Bond, Adolphe Menjou and Ronald Reagan—turned down their invitations as a protest against Khrushchev, but not nearly enough to make room for the hordes who demanded one. Hoping to ease the pressure, 20th Century Fox announced that it would not invite agents or the stars' spouses. The ban on agents crumbled within days, but the ban on spouses held. The only husband-and-wife teams invited were those in which both members were stars—Tony Curtis and Janet Leigh; Dick Powell and June Allyson; Elizabeth Taylor and Eddie Fisher. Marilyn Monroe's husband, the playwright Arthur Miller, might have qualified as a star, but he was urged to stay home because he was a leftist who'd been investigated by the House committee and therefore was considered too radical to dine with a communist dictator.

However, the studio was determined that Miller's wife attend. "At first, Marilyn, who never read the papers or listened to the news, had to be told who Khrushchev was," Lena Pepitone, Monroe's maid, recalled in her memoirs. "However, the studio kept insisting. They told Marilyn that in Russia, America meant two things, Coca-Cola and Marilyn Monroe. She loved hearing that and agreed to go. . . . She told me that the studio wanted her to wear the tightest, sexiest dress she had for the premier."

"I guess there's not much sex in Russia," Marilyn told Pepitone.

Monroe arrived in Los Angeles a day ahead of Khrushchev, flying from New York, near where she and Miller were then living. When she landed, a reporter asked if she'd come to town just to see Khrushchev.

"Yes," she said. "I think it's a wonderful thing, and I'm happy to be here."

That provoked the inevitable follow-up question: "Do you think Khrushchev wants to see you?"

"I hope he does," she replied.

The next morning, she arose early in her bungalow at the Beverly Hills Hotel and began the complex process of becoming Marilyn Monroe. First, her masseur, Ralph Roberts, gave her a rubdown. Then hairdresser Sydney Guilaroff did her hair. Then makeup artist Whitey Snyder painted her face. Finally, as instructed, she donned a tight, low-cut black patterned dress.

PETER CARLSON *spent 22 years at the* Washington Post *as a feature writer and columnist. He lives in Rockville, Maryland.*

A 1959 HERB BLOCK CARTOON, © THE HERB BLOCK FOUNDATION; P. 47 ELLIOTT ERWITT / MAGNUM PHOTOS

In the middle of this elaborate project, Spyros Skouras, the president of 20th Century Fox, dropped by to make sure that Monroe, who was notorious for being late, would arrive at this affair on time.

"She *has* to be there," he said.

And she was. Her chauffeur, Rudi Kautzsky, delivered her to the studio. When they found the parking lot nearly empty, she was scared.

"We must be *late*!" she said. "It must be over."

It wasn't. For perhaps the first time in her career, Marilyn Monroe had arrived early.

WAITING FOR KHRUSHCHEV TO ARRIVE, Edward G. Robinson sat at table 18 with Judy Garland and Shelley Winters. Robinson puffed on his cigar and gazed out at the kings and queens of Hollywood—the men wearing dark suits, the women in designer dresses and shimmering jewels. Gary Cooper was there. So was Kim Novak. And Dean Martin, Ginger Rogers, Kirk Douglas, Jack Benny, Tony Curtis and Zsa Zsa Gabor.

"This is the nearest thing to a major Hollywood funeral that I've attended in years," said Mark Robson, the director of *Peyton Place*, as he eyeballed the scene.

Marilyn Monroe sat at a table with producer David Brown, director Joshua Logan and actor Henry Fonda, whose ear was stuffed with a plastic plug that was attached to a transistor radio tuned to a baseball game between the Los Angeles Dodgers and the San Francisco Giants, who were fighting for the National League pennant.

Debbie Reynolds sat at table 21, which was located—by design—across the room from table 15, which was occupied by her ex-husband Eddie Fisher and his new wife, Elizabeth Taylor, who had been Reynolds' close friend until Fisher left her for Taylor.

The studio swarmed with plainclothes police, both American and Soviet. They inspected the shrubbery outside, the flowers on each table and both the men's and women's rooms. In the kitchen, an LAPD forensic chemist named Ray Pinker ran a Geiger counter over the food. "We're just taking precautions against the secretion of any radioactive poison that might be designed to harm Khrushchev," Pinker said before heading off to check the soundstage where the premier would watch the filming of *Can-Can*.

As Khrushchev's motorcade pulled up to the studio, the stars watched live coverage of his arrival on televisions that had been set up around the room, their knobs removed so nobody could change the channel to the Dodgers-Giants game. They saw Khrushchev emerge from a limo and shake hands with Spyros Skouras.

Ever mercurial, the Soviet dictator (below: in Maryland) griped to his hosts that America's pigs were too fat and its turkeys too skinny. He stole the spotlight, one reporter wrote, "with the studied nonchalance of an old vaudeville trouper."

A few moments later, Skouras led Khrushchev into the room and the stars stood to applaud. The applause, according to the exacting calibrations of the *Los Angeles Times*, was "friendly but not vociferous."

Khrushchev took a seat at the head table. At an adjacent table, his wife, Nina, sat between Bob Hope and Frank Sinatra. Elizabeth Taylor climbed on top of table 15 so she could get a better look at the dictator.

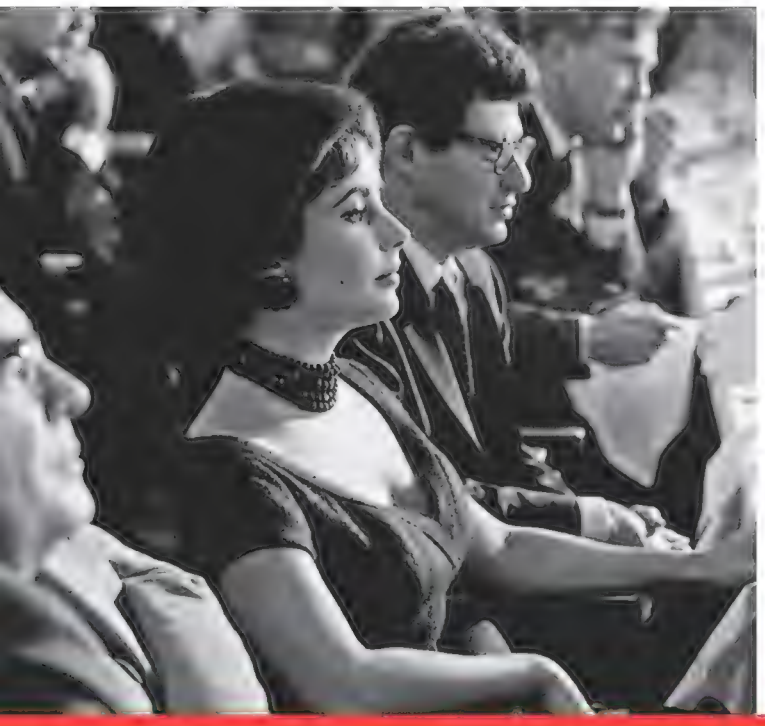
As the waiters delivered lunch—squab, wild rice, Parisian potatoes and peas with pearl onions—Charlton Heston, who'd once played Moses, attempted to make small talk with Mikhail Sholokhov, the Soviet novelist who would win the Nobel Prize in Literature in 1965. "I have read excerpts from your works," Heston said.

"Thank you," Sholokhov replied. "When we get some of your films, I shall not fail to watch some excerpts from them."

Nearby, Nina Khrushchev showed Frank Sinatra and David Niven pictures of her grandchildren and bantered with cowboy star Gary Cooper, one of the few American actors she'd actually seen on-screen. She told Bob Hope that she wanted to see Disneyland.

As Henry Cabot Lodge ate his squab, Los Angeles Police Chief William Parker suddenly appeared behind him, looking

Hollywood's stars came out at noon: Elizabeth Taylor and Eddie Fisher (below left), Bob Hope and Frank Sinatra (below right: with Nina Khrushchev). Marilyn Monroe (bottom) flew across the country.



"I understand you have canceled the trip to Disneyland," read the note to Lodge. "I am most displeased."

nervous. Earlier, when Khrushchev and his entourage had expressed interest in going to Disneyland, Parker had assured Lodge that he could provide adequate security. But during the drive from the airport to the studio, somebody threw a big, ripe tomato at Khrushchev's limo. It missed, splattering the chief's car instead.

Now, Parker leaned over and whispered into Lodge's ear. "I want you, as a representative of the president, to know that I will not be responsible for Chairman Khrushchev's safety if we go to Disneyland."

That got Lodge's attention. "Very well, Chief," he said. "If you will not be responsible for his safety, we do not go, and we will do something else."

Someone in Khrushchev's party overheard the conversation and immediately got up to tell the Soviet leader that Lodge had canceled the Disneyland trip. The premier sent a note back to the ambassador: "I understand you have canceled the trip to Disneyland. I am most displeased."

Studio president Spyros Skouras (left) and Khrushchev told competing rags-to-riches stories and heckled each other along the way.

WHEN THE WAITERS had cleared away the dishes, Skouras stood up to speak. Short, stocky and bald, Skouras, 66, looked a lot like Khrushchev. With a gravelly voice and a thick accent, he also sounded a lot like Khrushchev. "He had this terrible Greek accent—like a *Saturday Night Live* put-on," recalled Chalmers Roberts, who covered Khrushchev's U.S. tour for the *Washington Post*. "Everybody was laughing."

Khrushchev listened to Skouras for a while, then turned to his interpreter and whispered, "Why interpret for *me*? He needs it more."

Skouras may have sounded funny, but he was a serious businessman with a classic American success story. Son of a Greek shepherd, he had immigrated to America at 17, settling in St. Louis, where he sold newspapers, bused tables and saved his money. With two brothers, he invested in a movie theater, then another, and another. By 1932, he was managing a chain of 500 theaters. A decade later, he was running 20th Century Fox. "In all modesty, I beg you to look at me," he said to Khrushchev from the dais. "I am an example of one of those immigrants who, with my two brothers, came to this country. Because of the American system of equal opportunities, I am now fortunate enough to be president of 20th Century Fox."

Like so many other after-dinner orators on Khrushchev's trip, Skouras wanted to teach him about capitalism: "The capitalist system, or the price system, should not be criticized, but should be carefully analyzed—otherwise America would never have been in existence."

Skouras said he'd recently toured the Soviet Union and found that "warm-hearted people were sorrowful for the millions of unemployed people in America." He turned to Khrushchev. "Please tell your good people there is no unemployment in America to worry about."

Hearing that, Khrushchev could not resist heckling. "Let your State Department not give us these statistics about unemployment in your country," he said, raising his palms in a theatrical gesture of befuddlement. "I'm not to blame. They're *your* statistics. I'm only the reader, not the writer."

That got a laugh from the audience.

"Don't believe everything you read," Skouras shot back. That got a laugh, too.

When Skouras sat down, Lodge stood up to introduce Khrushchev. While the ambassador droned on about America's alleged affection for Russian culture, Khrushchev heckled him, plugging a new Soviet movie.

"Have you seen *They Fought for Their Homeland*?" the premier called out. "It is based on a novel by Mikhail Sholokhov."

"No," Lodge said, a bit taken aback.

"Well, buy it," said Khrushchev. "You should see it."

Smiling, the dictator stepped to the dais and invited the stars to visit the Soviet Union: "Please come," he said. "We will give you our traditional Russian pies."

He turned to Skouras—"my dear brother Greek"—and said he was impressed by his capitalist rags-to-riches story. But then he topped it with a communist rags-to-riches story. "I started working as soon as I learned how to walk," he said. "I herded cows for the capitalists. That was before I was 15. After that, I worked in a factory for a German. Then I worked in a French-owned mine." He paused and smiled. "Today, I am the premier of the great Soviet state."

Now it was Skouras' turn to heckle. "How many premiers do you have?"

"I will answer that," Khrushchev replied. He was premier of the whole country, he said, and then each of the 15 republics had its own premier. "Do you have that many?"

"We have two million American presidents of American corporations," Skouras replied.

Score one for Skouras! Of course, Khrushchev was not willing to concede anything.

"Mr. Tikhonov, please rise," the premier ordered.

At a table in the audience, Nikolai Tikhonov stood up.

"Who is he?" Khrushchev asked. "He is a worker. He became a metallurgical engineer. . . . He is in charge of huge chemical factories. A third of the ore mined in the Soviet Union comes from his region. Well, Comrade Greek, is that

CARL MYDANS / TIME LIFE PICTURES / GETTY IMAGES; P. 48 BURT GLINN / MAGNUM PHOTOS (3)

not enough for you?"

"No," Skouras shot back. "That's a monopoly."

"It is a people's monopoly," Khrushchev replied. "He does not possess anything but the pants he wears. It all belongs to the people!"

Earlier, Skouras had reminded the audience that American aid helped fight a famine in the Soviet Union in 1922. Now, Khrushchev reminded Skouras that before the Americans sent aid, they sent an army to crush the Bolshevik revolution. "And not only the Americans," he added. "All the capitalist countries of Europe and of America marched upon our country to strangle the new revolution. Never have any of our soldiers been on American soil, but your soldiers were on Russian soil. These are the facts."

Still, Khrushchev said, he bore no ill will. "Even under those circumstances," he said, "we are still grateful for the help you rendered."

Khrushchev then recounted his experiences fighting in the Red Army during the Russian civil war. "I was in the Kuban region when we routed the White Guard and threw them into the Black Sea," he said. "I lived in the house of a very interesting bourgeois intellectual family."

Here he was, Khrushchev went on, an uneducated miner with coal dust still on his hands, and he and other Bolshevik soldiers, many of them illiterate, were sharing the house with professors and musicians. "I remember the landlady asking me: 'Tell me, what do you know about ballet? You're a simple miner, aren't you?' To tell the truth, I didn't know anything about ballet. Not only had I never seen a ballet, I had never seen a ballerina."

The audience laughed.

"I did not know what sort of dish it was or what you ate it with."

That brought more laughter.

"And I said, 'Wait, it will all come. We will have everything—and ballet, too.' "

Even the tireless Red-bashers of the Hearst press conceded that "it was almost a tender moment." But of course Khrushchev could not stop there. "Now I have a question for you," he said. "Which country has the best ballet? Yours? You do not even have a permanent opera and ballet theater. Your theaters thrive on what is given to them by rich people. In our country, it is the state that gives the money. And the best ballet is in the Soviet Union. It is our pride."

He rambled on, then apologized for rambling. After 45 minutes of speaking, he seemed to be approaching an amiable closing. Then he remembered Disneyland.

"Just now, I was told that I could not go to Disneyland," he announced. "I asked, 'Why not? What is it? Do you have rocket-launching pads there?' "

"He seemed to be enjoying [*Can-Can*]" (above and right: with Shirley MacLaine), a witness said. But Khrushchev's levity was short-lived.

The audience laughed.

"Just listen," he said. "Just listen to what I was told: 'We—which means the American authorities—cannot guarantee your security there.' "

He raised his hands in a vaudevillian shrug. That got another laugh.

"What is it? Is there an epidemic of cholera there? Have gangsters taken hold of the place? Your policemen are so tough they can lift a bull by the horns. Surely they can restore order if there are any gangsters around. I say, 'I would very much like to see Disneyland.' They say, 'We cannot guarantee your security.' Then what must I do, commit suicide?"

Khrushchev was starting to look more angry than amused. His fist punched the air above his red face.

"That's the situation I find myself in," he said. "For me, such a situation is inconceivable. I cannot find words to explain this to my people."

The audience was baffled. Were they really watching the 65-year-old dictator of the world's largest country throw a temper tantrum because he couldn't go to Disneyland?

Sitting in the audience, Nina Khrushchev told David Niven that she really was disappointed that she couldn't see Disneyland. Hearing that, Sinatra, who was sitting next to Mrs. Khrushchev, leaned over and whispered in Niven's ear.

"Screw the cops!" Sinatra said. "Tell the old broad that you and I will take 'em down there this afternoon."

Before long, Khrushchev's tantrum—if that's what it was—faded away. He grumbled a bit about how he'd been stuffed into a sweltering limousine at the airport instead of a nice, cool convertible. Then he apologized, sort of: "You will say, perhaps, 'What a difficult guest he is.' But I adhere to the Russian rule: 'Eat the bread and salt but always speak your mind.' Please forgive me if I was somewhat hot-headed. But the temperature here contributes to this. Also"—he turned to Skouras—"my Greek friend warmed me up."

Relieved at the change of mood, the audience applauded. Skouras shook Khrushchev's hand and slapped him on the back and the two old, fat, bald men grinned while the stars, who recognized a good show when they saw one, rewarded them with a standing ovation.

THE LUNCH OVER, Skouras led his new friend toward the soundstage where *Can-Can* was being filmed, stopping to greet various celebrities along the way. When Skouras spotted Marilyn Monroe in the crowd, he hastened to introduce her to the premier, who'd seen a huge close-up of her face—a clip from *Some Like It Hot*—in a film about American life at an American exhibition in Moscow. Now, Khrushchev shook her hand and looked her over.

Watch a slide show of Khrushchev's American tour at Smithsonian.com/khrushchev

BOB HENRIQUES / MAGNUM PHOTOS; P. 51 NAT FARBMAN / TIME LIFE PICTURES / GETTY IMAGES

"You're a very lovely young lady," he said, smiling.

Later, she would reveal what it was like to be eyeballed by the dictator: "He looked at me the way a man looks on a woman." At the time, she reacted to his stare by casually informing him that she was married.

"My husband, Arthur Miller, sends you his greeting," she replied. "There should be more of this kind of thing. It would help both our countries understand each other."

Skouras led Khrushchev and his family across the street to Sound Stage 8 and up a rickety wooden staircase to a box above the stage. Sinatra appeared onstage wearing a turn-of-the-century French suit—his costume. He played a French lawyer who falls in love with a dancer, played by Shirley MacLaine, who was arrested for performing a banned dance called the cancan. "This is a movie about a lot of pretty girls—and the fellows who like pretty girls," Sinatra announced.

Hearing a translation, Khrushchev grinned and applauded.

"Later in this picture, we go to a saloon," Sinatra continued. "A saloon is a place where you go to drink."

Khrushchev laughed at that, too. He seemed to be having a good time.

Shooting commenced; lines were delivered, and after a dance number that left no doubts why the cancan had once been banned, many spectators—American and Russian—wondered: *Why did they choose this for Khrushchev?*

"It was the worst choice imaginable," Wiley T. Buchanan, the State Department's chief of protocol, later recalled. "When the male dancer dived under [MacLaine's] skirt and emerged holding what seemed to be her red panties, the Americans in the audience gave an audible gasp of dismay, while the Russians sat in stolid, disapproving silence."

Later, Khrushchev would denounce the dance as pornographic exploitation, though at the time he seemed happy enough.

"I was watching him," said Richard Townsend Davies of the State Department, "and he seemed to be enjoying it."

Sergei Khrushchev, the premier's son, wasn't so sure. "Maybe father was interested, but then he started to think, *What does this mean?*" he recalled. "Because Skouras was very friendly, Father did not think it was some political provocation. But there was no explanation. It was just American life." Sergei shrugged, then added: "Maybe Khrushchev liked it, but I will say for sure: My mother did not like it."

A few moments later, Khrushchev slid into a long black limousine with huge tailfins. Lodge slipped in after him. The limo inched forward, slowly picking up speed. Having put the kibosh on Disneyland, Khrushchev's guides were compelled to come up with a new plan. They took the premier on a tour of tract housing developments instead.

Khrushchev never did get to Disneyland.

Afterward, many spectators—American and Russian—wondered: Why did they choose this for Khrushchev?

We Have Liftoff

Forty years ago this month, the ***Apollo 11*** mission put men on the moon—and brought America to Florida's shore

TEXT AND PHOTOGRAPHS BY DAVID BURNETT

In the summer of 1969, all eyes turned to a spit of land on Florida's Atlantic coast—the site of the Kennedy Space Center, named for the president who had challenged the nation to put a man on the moon before the end of the decade. That July, the *Apollo 11* mission would attempt just that. I was 22, a year out of Colorado College and working as a photographer at *Time* magazine's Miami bureau. In the days before the launch, thousands of people drove from all over the country to see it firsthand, converging on Titusville, across the Indian River from NASA Launch Complex 39-A. I asked my superiors if I could cover these witnesses to history. The previous year had been one of division over the Vietnam War and trauma over the assassinations of Martin Luther King Jr. and Robert F. Kennedy, but now a sense of common purpose pervaded the beach. At 9:32 a.m. on July 16, the rocket's engines ignited amid a plume of smoke and flame. I didn't see it. I was looking into the faces of my proud, expectant countrymen.

PEOPLE BROUGHT THEIR children, their folding chairs and their binoculars (above). The previous Christmas Eve, the *Apollo 8* astronauts had read from the Book of Genesis as they orbited the moon; that hopeful mood translated into the selling of *Apollo 11* souvenirs even before the flight (left). At takeoff, as the noise and the shock waves rippled across the water toward us, I told myself, "I'm not going to come all this way and *not* see the rocket." So I turned around and made one frame of it clearing the gantry (opposite) before turning back to my assigned subject, the crowd.

THE DAY BEFORE THE LAUNCH was like an exodus in reverse. Local officials expected nearly a million visitors, and it seemed as if their expectations would be met. Early arrivals staked out campsites on the Indian River across from the launch site (top) or took rooms in motels (right), where space-related pastimes prevailed. As I sought spots from which I could shoot crowds on the beach, it dawned on me that I'd have to wade into the water; I made a mental note to look out for broken glass. That evening I headed over to a square dance at the local mall and was surprised to see a lot of people there. I couldn't say why, but a square dance seemed like a fitting send-off for the astronauts.

See more of David Burnett's photos at Smithsonian.com/apollo11

ALL PHOTOS: DAVID BURNETT / CONTACT PRESS IMAGES

AROUND DUSK the lights went up on the launchpad (top), and the vigil seemed to begin in earnest. Late into the night I photographed people sleeping in, on or beneath their cars, though I thought many of them were too excited to sleep. Women stood in a long file outside a gas station restroom without detectable annoyance, almost as if the wait were a badge of honor. Even after launch day dawned, hours passed before liftoff. It was so long in coming and so quickly gone, yet it remains burned into my memory like a slow-motion movie.

DAVID BURNETT *returned to Florida this past May to shoot the launch of the mission to repair the Hubble space telescope.*

Can scientists build a machine that, like a child, learns as it goes and plays well with others? A California-based group is finding out

Birth of a Robot

BY ABIGAIL TUCKER

PHOTOGRAPHS BY TIMOTHY ARCHIBALD

EINSTEIN THE ROBOT HAS ENCHANTING EYES, THE COLOR of honey in sunlight. They are fringed with drugstore-variety false eyelashes and framed by matted gray brows made from real human hair. "What is that, makeup?" a visiting engineer asks, and, indeed, on closer examination I can see black eyeliner smeared beneath Einstein's lower lids, à la David Bowie in 1971. The machine's gaze is expressive—soulful, almost.

David Hanson, Einstein's creator, is visiting from Texas to help scientists here at the University of California at San Diego (UCSD) prepare the robot for an upcoming conference. Hanson switches the robot on—really just a head and neck—and runs it through some of its dozens of expressions. Its lips purse. Its brow furrows. Its eyes widen as though in horror, then scrunch mirthfully as it flashes a grin. The 27 motors in the face make a wretched grinding sound, and when the mouth opens, I see a tangle of wires where the prodigious brain should be. Einstein's

Building a robot that humans can love is pretty ambitious. But Javier Movellan (in his San Diego lab with RUBI) says he would like to develop a robot that loves humans.

white wig is missing and the skin of its neck hangs in flaps, because its shoulders, made of plastic, got shattered in shipping.

Still, the effect is so lifelike that even jaded graduate students have stopped by to stroke the robot's wrinkled cheek, which is encased in a substance called Frubber—"face rubber," Hanson explains—that feels buttery soft and cold as a cadaver. Engineers working at night have been so unnerved by Einstein's presence they asked that it be covered up.

That delights Javier Movellan, leader of the university group that recently spent $70,000 in research grants to buy the robotic head from Hanson. Einstein will eventually be able to track people's movements with cameras that twinkle behind its pupils and judge their gender, age (well, whether they're over or under 40), if they wear glasses or have facial hair and when they're smiling. The robot is also equipped with conversational software and can hold forth while staring deep into a person's eyes. "Do you know any jokes?" Hanson asks the machine.

Einstein: Why did the chicken cross the road?

Hanson: Tell me about artificial intelligence.

Einstein: I feel real, not artificial.

Hanson: I want to hear more about the future of robotics.

Einstein: Robots will become ever more like animals and people. Robots will continue to get more amazing and cool.

Einstein is the product of a remarkable collaboration. Hanson, a robot designer and the founder of the Dallas-based firm Hanson Robotics, has used classical sculpting techniques to animate robotic likenesses of Philip K. Dick, author of *Do Androids Dream of Electric Sheep?* (the basis of the apocalyptic movie *Blade Runner*), his own wife (he had to use a male skull model, "which masculinized her a bit") and more than a dozen other people. Movellan, a psychologist and software pioneer who runs UCSD's Machine Perception Laboratory, develops technology that approximates human senses. Einstein is, at present, a research tool to explore how a machine can perceive and react to human facial expressions; that capacity could later have many practical applications in entertainment and education, alerting the robot teachers of the future, say, that their human pupils are daydreaming.

For the most part, though, the intelligence I perceived in Einstein—its intense eye contact, its articulate soliloquies—was an illusion. Its answers to questions were canned and its interpretive powers were extremely limited. In short, Einstein is no Einstein. Overall, robots can do amazing things—play the violin, dismantle bombs, fire missiles, diagnose diseases, tend tomato plants, dance—but they sorely lack the basics. They recite jokes but don't get them. They can't summarize a movie. They can't tie their shoelaces. Because of such shortcomings, whenever we encounter them in the flesh, or Frubber, as it were, they are bound to disappoint.

Rodney Brooks, an M.I.T. computer scientist who masterminded a series of robotics innovations in the 1990s, said recently that for a robot to have truly humanlike intelligence, it would need the object-recognition skills of a 2-year-old child, the language capabilities of a 4-year-old, the manual dexterity of a 6-year-old and the social understanding of an 8-year-old. Experts say they are far from reaching those goals. In fact, the problems that now confound robot programmers are puzzles that human infants often solve before their first birthday. How to reach for an object. How to identify a few individuals. How to tell a stuffed animal from a bottle of formula. In babies, these skills are not preprogrammed, as were the perceptual and conversational tricks Einstein showed me, but rather are cultivated through interactions with people and the environment.

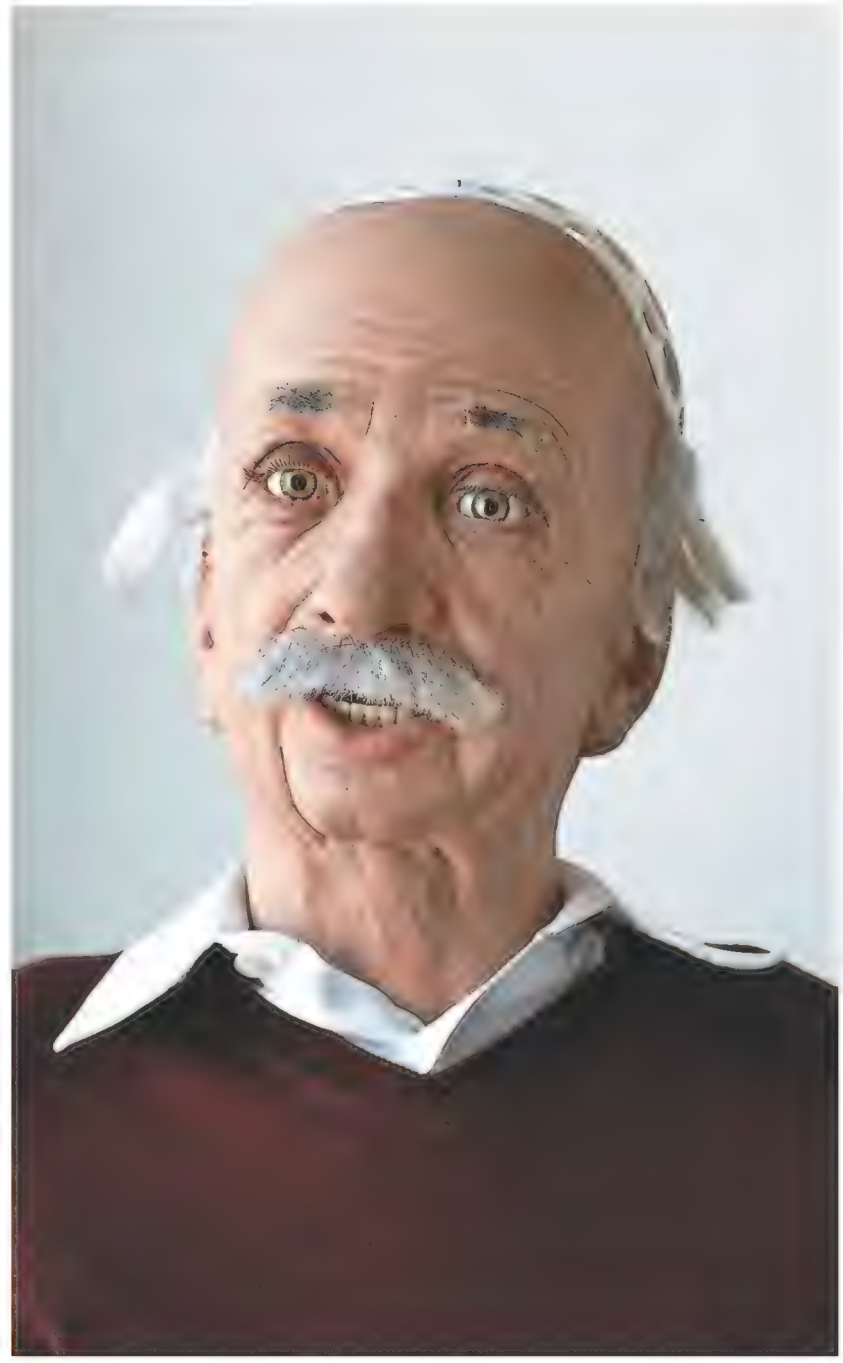
But what if a robot could develop that way? What if a machine could learn like a child, as it goes along? Armed with a nearly $3 million National Science Foundation grant, Movellan is now tackling that very question, leading a team of cognitive scientists, engineers, developmental psychologists and roboticists from UCSD and beyond. Their experiment—called Project One, because it focuses on the first year of development—is a wildly ambitious effort to crack the secrets of human intelligence. It involves, their grant proposal says, "an integrated system . . . whose sensors and actuators approximate the levels of complexity of human infants."

In other words, a baby robot.

For the most part, the intelligence I perceived in Einstein was an illusion. Its answers to questions were canned and its interpretive powers were extremely limited. In short, Einstein is no Einstein.

THE WORD "ROBOT" HIT THE WORLD STAGE in 1921, in the Czech science fiction writer Karel Capek's play *Rossum's Universal Robots*, about a factory that creates artificial people. The root is the Czech *robota*, for serf labor or drudgery. Broadly understood, a robot is a machine that can be programmed to interact with its surroundings, usually to do physical work.

We may associate robots with artificial intelligence, which uses powerful computers to solve big problems, but robots are not usually designed with such lofty aspirations; we might dream of Rosie, the chatty robot housekeeper on "The Jetsons," but for now we're stuck with Roomba, the disk-shaped, commercially available autonomous vacuum cleaner. The first industrial robot, called Unimate, was installed in a General Motors factory in 1961 to stack hot pieces of metal from a die-casting machine. Today, most of the world's estimated 6.5 million robots perform



Robot designer David Hanson (above left: fashioning Einstein at his Dallas firm) invented the skinlike Frubber, or face rubber. Now a guinea pig in Movellan's lab, Einstein (above right) tells jokes and moves its mouth, eyes and other features.

similarly mundane industrial jobs or domestic chores, though 2 million plug away at more whimsical tasks, like mixing cocktails. "Does [the robot] prepare the drink with style or dramatic flair?" ask the judging guidelines for the annual RoboGames bartending competition, held in San Francisco this summer. "Can it prepare more than a martini?"

Now imagine a bartender robot that could waggle its eyebrows sympathetically as you pour out the story of your messy divorce. Increasingly, the labor we want from robots involves social fluency, conversational skill and a convincing humanlike presence. Such machines, known as social robots, are on the horizon in health care, law enforcement, child care and entertainment, where they might work in concert with other robots and human supervisors. Someday, they might assist the blind; they've already coached dieters in an experiment in Boston. The South Korean government has said it aims to have a robot working in every home by 2020.

Part of the new emphasis on social functioning reflects the changing economies of the richest nations, where manufacturing has declined and service industries are increasingly important. Not coincidentally, societies with low birthrates and long life expectancies, notably Japan, are pushing hardest for social robots, which may be called upon to stand in for young people and perform a wide variety of jobs, including caring for and comforting the old.

Some scientists working on social robots, like Movellan and his team, borrow readily from developmental psychology. A machine might acquire skills as a human child does by starting with a few basic tasks and gradually constructing a more sophisticated competence—"bootstrapping," in scientific parlance. In contrast to preprogramming a robot to perform a fixed set of actions, endowing a robot computer with the capacity to acquire skills gradually in response to the environment might produce smarter, more human robots.

"If you want to build an intelligent system, you have to build a system that becomes intelligent," says Giulio Sandini, a bioengineer specializing in social robots at the Italian Institute of Technology in Genoa. "Intelligence is

LEFT: RON HEFLIN / AP IMAGES

“We want to program it with curiosity, not knowledge,” graduate student Nicholas Butko (with Bev, a robot tethered to a computer capable of learning) says of the powerful Project One robot that he’s helping develop.

not only what you know but how you learn more from what you know. Intelligence is acquiring information, a dynamic process."

"THIS IS THE BRAINS!" MOVELLAN SHOUTED over the din of cyclone-strength air conditioners. He was pointing at a stack of computers about ten feet tall and six feet deep, sporting dozens of blinking blue lights and a single ominous orange one. Because the Project One robot's metal cranium will not be able to hold all the information-processing hardware that it will need, the robot will be connected by fiber-optic cables to these computers in the basement of a building on the UCSD campus in La Jolla. The room, filled with towering computers that would overheat if the space weren't kept as cold as a meat locker, looks like something out of *2001: A Space Odyssey*.

As Einstein could tell you, Movellan is over 40, bespectacled and beardless. But Einstein has no way of knowing that Movellan has bright eyes and a bulky chin, is the adoring father of an 11-year-old daughter and an 8-year-old son and speaks English with an accent reflecting his Spanish origins.

Movellan grew up amid the wheat fields of Palencia, Spain, the son of an apple farmer. Surrounded by animals, he spent endless hours wondering how their minds worked. "I asked my mother, 'Do dogs think? Do rats think?'" he says. "I was fascinated by things that think but have no language."

He also acquired a farm boy's knack for working with his hands; he recalls that his grandmother scolded him for dissecting her kitchen appliances. Enamored of the nameless robot from the 1960s television show "Lost in Space," he built his first humanoid when he was about 10, using "food cans, light bulbs and a tape recorder," he says. The robot, which had a money slot, would demand the equivalent of $100. As Movellan anticipated, people usually forked over much less. "That's not $100!" the robot's prerecorded voice would bellow. Ever the mischievous tinkerer, he drew fire 30 years later from his La Jolla homeowners association for welding robots in his garage.

He got his PhD in developmental psychology at the University of California at Berkeley in 1989 and moved on to Carnegie Mellon University, in Pittsburgh, to conduct artificial intelligence research. "The people I knew were not really working on social robots," he says. "They were working on vehicles to go to Mars. It didn't really appeal to me. I always felt robotics and psychology should be more together than they originally were." It was after he went to UCSD in 1992 that he began working on replicating human senses in machines.

A turning point came in 2002, when he was living with his family in Kyoto, Japan, and working in a government robotics lab to program a long-armed social robot named Robovie. He hadn't yet had much exposure to the latest social robots and initially found them somewhat annoying. "They would say things like, 'I'm lonely, please hug me,'" Movellan recalls. But the Japanese scientists warned him that Robovie was special. "They would say, 'you'll feel something.' Well, I dismissed it—until I felt something. The robot kept talking to me. The robot looked up at me and, for a moment, I swear this robot was alive."

Then Robovie enfolded him in a hug and suddenly—"magic," says Movellan. "This is something I was unprepared for from a scientific point of view. This intense feeling caught me off guard. I thought, Why is my brain put together so that this machine got me? Magic is when the robot is looking at things and you reflexively want to look in the same direction as the robot. When the robot is looking at you instead of through you. It's a feeling that comes and goes. We don't know how to make it happen. But we have all the ingredients to make it happen."

Eager to understand this curious reaction, Movellan introduced Robovie to his 2-year-old son's preschool class.

I had seen Bev slumped on a shelf above Butko's desk without realizing that the Toys 'R' Us-bought doll was a primitive robot. Then I noticed the camera planted in the middle of Bev's forehead, like a third eye.

But there the robot cast a different spell. "It was a big disaster," Movellan remembers, shaking his head. "It was horrible. It was one of the worst days of my life." The toddlers were terrified of Robovie, who was about the size of a 12-year-old. They ran away from it screaming.

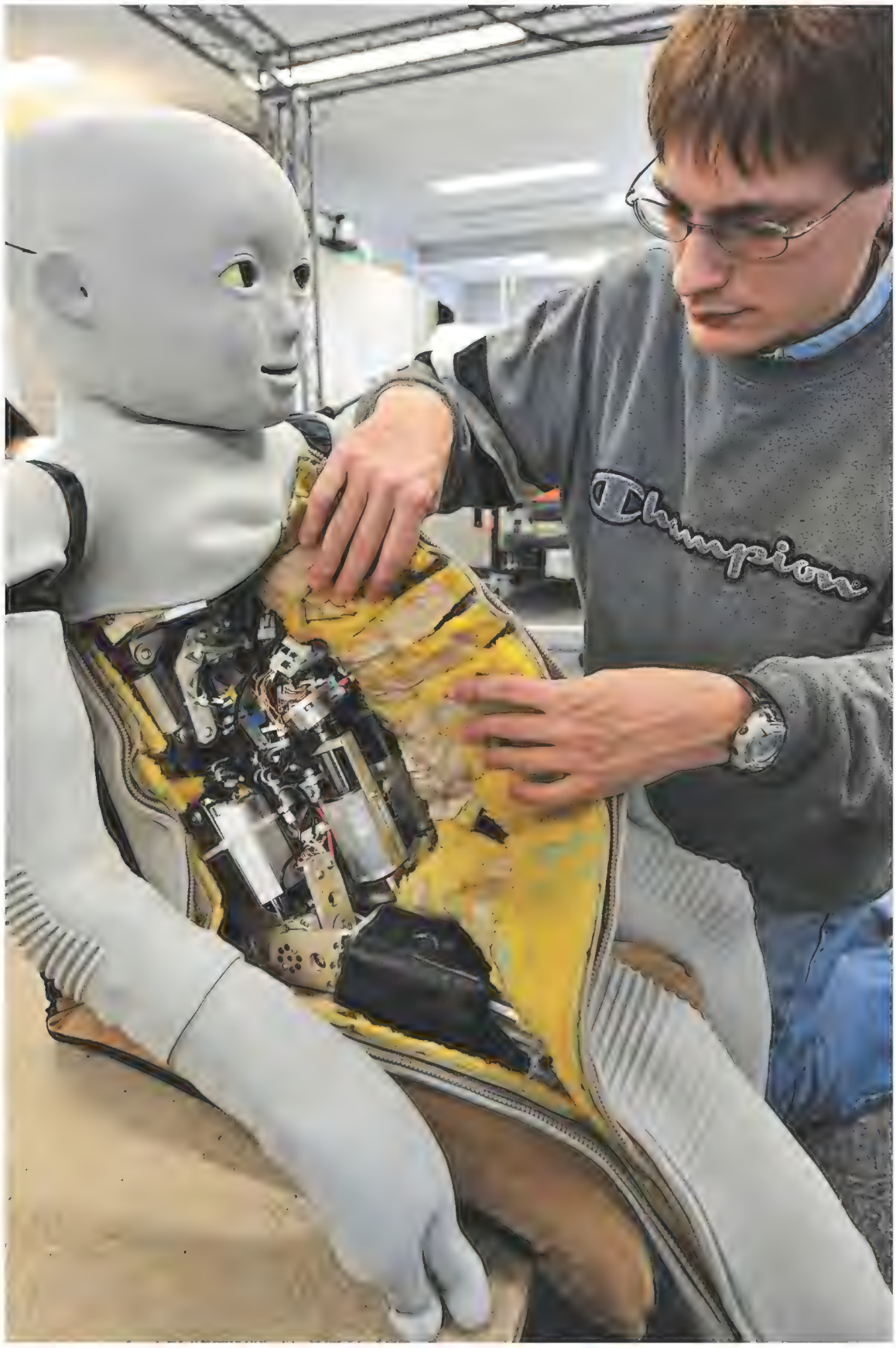
That night, his son had a nightmare. Movellan heard him muttering Japanese in his sleep: "*Kowai, kowai.*" Scary, scary.

Back in California, Movellan assembled, in consultation with his son, a kid-friendly robot named RUBI that was more appropriate for visits to toddler classrooms. It was an early version of the smiling little machine that stands sentinel in the laboratory today, wearing a jaunty orange Harley-Davidson bandanna and New Balance sneakers, its head swiveling in an inquisitive manner. It has coasters for eyes and a metal briefcase for a body that snaps open to reveal a bellyful of motors and wires.

"We have learned a lot from this little baby," Movellan said, giving the robot an affectionate pat on its square cheek.

For the past several years he has embedded RUBI at a

Staff writer **ABIGAIL TUCKER** *last wrote for the magazine about narwhals. This is San Francisco-based photographer* **TIMOTHY ARCHIBALD***'s first assignment for* SMITHSONIAN.



With 51 motors and scores of tactile sensors, the CB2 humanoid (above: being examined by a researcher at Osaka University in Japan) is the prototype body for the Project One robot. But that machine might be able to walk on its own. And, Movellan says, "We want it to be cute."

university preschool to study how the toddlers respond. Various versions of RUBI (some of them autonomous and others puppeteered by humans) have performed different tasks. One taught vocabulary words. Another accompanied the class on nature walks. (That model was not a success; with its big wheels and powerful motors, RUBI swelled to an intimidating 300 pounds. The kids were wary, and Movellan was, too.)

The project has had its triumphs—the kids improved their vocabularies playing word games displayed on RUBI's stomach screen—but there have been setbacks. The children destroyed a fancy robotic arm that had taken Movellan and his students three months to build, and RUBI's face detector consistently confused Thomas the Tank Engine with a person. Programming in incremental fixes for these problems proved frustrating for the scientists. "To survive in a social environment, to sustain interaction with people, you can't possibly have everything preprogrammed," Movellan says.

THOSE MAGIC MOMENTS WHEN A machine seems to share in our reality can sometimes be achieved by brute computing force. For instance, Einstein's smile-detection system, a version of which is also used in some cameras, was shown tens of thousands of photographs of faces that had been marked "smiling" or "not smiling." After cataloging those images and discerning a pattern, Einstein's computer can "see" whether you are smiling, and to what degree. When its voice software is cued to compliment your pretty smile or ask why you look sad, you might feel a spark of unexpected emotion.

But this laborious analysis of spoon-fed data—called "supervised learning"—is nothing like the way human babies actually learn. "When you're little nobody points out ten thousand faces and says 'This is happy, this is not happy, this is the left eye, this is the right eye,'" said Nicholas Butko, a PhD student in Movellan's group. (As an undergraduate, he was sentenced to labeling a seemingly infinite number of photographs for a computer face-recognition system.) Yet babies are somehow able to glean what a human face is, what a smile signifies and that a certain pattern of light and shadow is Mommy.

To show me how the Project One robot might learn like an infant, Butko introduced me to Bev, actually BEV, as in Baby's Eye View. I had seen Bev slumped on a shelf above Butko's desk without realizing that the Toys 'R' Us-bought baby doll was a primitive robot. Then I noticed the camera planted in the middle of Bev's forehead, like a third eye, and the microphone and speaker under its purple T-shirt, which read, "Have Fun."

YOSHIKAZU TSUNO / AFP / GETTY IMAGES

In one experiment, the robot was programmed to monitor noise in a room that people periodically entered. They'd been taught to interact with the robot, which was tethered to a laptop. Every now and then, Bev emitted a babylike cry. Whenever someone made a sound in response, the robot's camera snapped a picture. The robot sometimes took a picture if it heard no sound in response to its cry, whether or not there was a person in the room. The robot processed those images and quickly discerned that some pictures—usually those taken when it heard a response—included objects (faces and bodies) not present in other pictures. Although the robot had previously been given no information about human beings (not even that such things existed), it learned within six minutes how to tell when someone was in the room. In a remarkably short time, Bev had "discovered" people.

A similar process of "unsupervised learning" is at the heart of Project One. But Project One's robot will be much more physically sophisticated than Bev—it will be able to move its limbs, train its cameras on "interesting" stimuli and receive readings from sensors throughout its body—which will enable it to borrow more behavior strategies from real infants, such as how to communicate with a caregiver. For example, Project One researchers plan to study human babies playing peekaboo and other games with their mothers in a lab. Millisecond by millisecond, the researchers will analyze the babies' movements and reactions. This data will be used to develop theories and eventually programs to engineer similar behaviors in the robot.

Perhaps the team's grandest goal is to give the robot the capacity to signal for a caregiver to retrieve an object beyond its grasp. Movellan calls this the "Vygotsky reach," after developmental psychologist Lev Vygotsky, who identified the movement—which typically occurs when a child is about a year old—as an intellectual breakthrough, a transition from simple sensory-motor intelligence to symbolic intelligence. If the scientists are successful, it will be the first spontaneous symbolic gesture by a robot. It will also be a curious role reversal—the robot commanding the human, instead of vice versa.

"That's a pretty important transition," says Jonathan Plucker, a cognitive scientist at Indiana University who studies human intelligence and creativity. Plucker had no prior knowledge of Project One and its goals, but he was fresh from watching the season finale of "Battlestar Galactica," which had left him leery of the quest to build intelligent robots. "My sense is that it wouldn't be hard to have a robot that reaches for certain types of objects," he says, "but it's a big leap to have a machine that realizes it wants to reach for something and uses another object, a caregiver, as a tool. That is a much, much more complex psychological process."

At present, the Project One robot is all brains. While the big computer hums in its air-conditioned cavern, the body is being designed and assembled in a factory in Japan.

Construction is expected to take about nine months.

If you search for "creepy robot baby" on YouTube, you can see clips of four-foot-tall CB2 in action. Its silicone skin has a grayish cast; its blank, black eyes dart back and forth.

It's even harder than it sounds; playing peekaboo requires a relatively nuanced understanding of "others." "We know it's a hell of a problem," says Movellan. "This is the kind of intelligence we're absolutely baffled by. What's amazing is that infants effortlessly solve it." In children, such learning is mediated by the countless connections that brain cells, or neurons, form with one another. In the Project One robot and others, the software itself is formulated to mimic "neural networks" like those in the brain, and the theory is that the robot will be able to learn new things virtually on its own.

The robot baby will be able to touch, grab and shake objects, and the researchers hope that it will be able to "discover" as many as 100 different objects that infants might encounter, from toys to caregivers' hands, and figure out how to manipulate them. The subtleties are numerous; it will need to figure out that, say, a red rattle and a red bottle are different things and that a red rattle and a blue rattle are essentially the same. The researchers also want the robot to learn to crawl and ultimately walk.

A PROTOTYPE OF THE PROJECT ONE robot body already exists, in the Osaka laboratory of Hiroshi Ishiguro, the legendary Japanese roboticist who, in addition to creating Robovie, fashioned a robotic double of himself, named Geminoid, as well as a mechanical twin of his 4-year-old daughter, which he calls "my daughter's copy." ("My daughter didn't like my daughter's copy," he told me over the phone. "Its movement was very like a zombie." Upon seeing it, his daughter—the original—cried.) Ishiguro's baby robot is called the Child-Robot with Biomimetic Body, or CB2 for short. If you search for "creepy robot baby" on YouTube, you can see clips of four-foot-tall CB2 in action. Its silicone skin has a grayish cast; its blank, black eyes dart back and forth. When first unveiled in 2007, it could do little more than writhe, albeit in a very babylike way, and make pathetic vowel sounds out of the tube of silicone that is its throat.

"It has this ghostly gaze," says Ian Fasel, a University of Arizona computer scientist and a former student of Movellan's who has worked on the Japanese project. "My friends who see it tell me to please put it out of its misery. It was often lying on the floor of the lab, flopping around.

It gives you this feeling that it's struggling to be a real boy, but it doesn't know how."

When Movellan first saw CB2, last fall, as he was shopping around for a Project One body, he was dismayed by the lack of progress the Japanese scientists had made in getting it to move in a purposeful way. "My first impression was that there was no way we would choose that robot," Movellan recalls. "Maybe this robot is impossible to control. If you were God himself, could you control it?"

Still, he couldn't deny that the CB2 was an exquisite piece of engineering. There have been other explicitly childlike robots over the years—creations such as Babybot and Infanoid—but none approach CB2's level of realism. Its skin is packed with sensors to collect data. Its metal skeleton and piston-driven muscles are limber, like a person's, not stiff like most robots', and highly interconnected: if an arm moves, motors in the torso and elsewhere respond. In the end, Movellan chose CB2.

The body's human-ness would help the scientists develop more brainlike software, Movellan decided. "We could have chosen a robot that could already do a lot of the things we want it to do—use a standard robotic arm, for instance," Movellan says. "Yet we felt it was a good experiment in learning to control a more biologically inspired body that approximates how muscles work. Starting with an arm more like a real arm is going to teach us more."

The Project One team has requested tweaks in CB2's design, to build in more powerful muscles that Movellan hopes will give it the strength to walk on its own, which the Japanese scientists—who are busy developing a new model of their own—now realize the first CB2 will never do. Movellan is also doing away with the skin suit, which sometimes provides muddled readings, opting instead for a Terminator-like metal skeleton encased in clear plastic. ("You can always put clothes on," Movellan reasons.) He had hoped to make the robot small enough to cradle, but the Japanese designers told him that is currently impossible. The baby will arrive standing about three feet tall and weighing 150 pounds.

What a social robot's face should look like is a critical, and surprisingly difficult, decision. CB2's face is intended to be androgynous and abstract, but somehow it has tumbled into what robotics experts term the "uncanny valley," where a machine looks just human enough to be unsettling. The iCub, another precocious child-inspired robot being built by a pan-European team, looks more appealing, with cartoonish wide eyes and an endearing expression. "We told the designers to make it look like someone who needed help," says the Italian Institute of Technology's Sandini, who's leading the project. "Someone . . . a little sad."

When I met Movellan he seemed flummoxed by the matter of his robot's facial appearance: Should the features be skeletal or soft-tissue, like Einstein's? He was also pondering whether it would be male or female. "All my robots so far have been girls—my daughter has insisted," he explains. "Maybe it's time for a boy." Later, he and his coworkers asked Hanson to help design a face for the Project One robot, which will be named Diego. The "developmental android" will be modeled after a real child, the chubby-cheeked nephew of a researcher in Movellan's lab.

Though Movellan believes that a human infant is born with very little pre-existing knowledge, even he says it comes with needs: to be fed, warmed, napped and relieved of a dirty diaper. Those would have to be programmed into the robot, which quickly gets complicated. "Will this robot need to evacuate?" says John Watson, a University of California at Berkeley professor emeritus of psychology who is a Project One consultant. "Will the thing need sleep cycles? We don't know."

Others outside the project are skeptical that baby robots will reveal much about human learning, if only because a human grows physically as well as cognitively. "To mimic infant development, robots are going to have to change their morphology in ways that the technology isn't up to," says Ron Chrisley, a cognitive scientist at the University of Sussex in England. He says realistic human features are usually little more than clever distractions: scientists should focus on more basic models that teach us about the nature of intelligence. Human beings learned to fly, Chrisley notes, when we mastered aerodynamics, not when we fashioned realistic-looking birds. A socially capable robot might not resemble a human being anymore than an airplane looks like a sparrow.

Human beings learned to fly when we mastered aerodynamics, not when we fashioned realistic-looking birds. A socially capable robot might not resemble a human anymore than an airplane looks like a sparrow.

Maybe the real magic of big-eyed, round-faced robobabies is their ability to manipulate our own brains, says Hamid Ekbia, a cognitive science professor at Indiana University and the author of *Artificial Dreams: The Quest for Non-Biological Intelligence*. Infantalized facial features, he says, primarily tap into our attraction to cute kids. "These robots say more about us than they do about machines," says Ekbia. "When people interact with these robots, they get fascinated, but they read beneath the surface. They attribute qualities to the robot that it doesn't have. This is our disposition as human beings: to read more than there is."

Of course, Movellan would counter that such fascination is, in Project One's case, quite essential: to develop

like a real child, the machine must be treated like one.

Each Project One researcher defines success differently. Some will declare victory if the robot learns to crawl or to identify basic objects. Watson says he would be grateful to simulate the first three months of development. Certainly, no one expects the robot to progress at the same rate as a child. Project One's timeline extends over four years, and it may take that long before the robot is exposed to people outside the lab—"caregivers" (read: undergrads) who will be paid to baby-sit. Lacking a nursery, the robot will be kept behind glass on a floor beneath Movellan's lab, accessible, for the time being, only to researchers.

As for Movellan, he hopes that the project will "change the way we see human development and bring a more computational bent to it, so we appreciate the problems the infant brain is solving." A more defined understanding of babies' brains might also give rise to new approaches to developmental disorders. "To change the questions that psychologists are asking—that to me is the dream," Movellan adds. "For now it is, how do you get its arm to work, the leg to work? But when we put the pieces together, things will really start to happen."

A psychologist by training, Movellan (at left, in San Diego with preschoolers and RUBI the robot) says kids warm to the machines if they are pint-size and don't look eerily human. But social robots will have to become far more flexible to serve as playmates or babysitters.

BEFORE LEAVING THE LAB, I stop to bid goodbye to Einstein. All is not well with the robot. Its eye cameras have become obsessed with the glowing red exit sign over the workshop's door. Hanson switches the robot off and on; its movements are palsied; its eyes roll. Its German accent isn't working and the tinny-sounding conversational software seems to be on the fritz. Hanson peers into its eyes. "Hi there," he says. "Can you hear me? Are you listening?"

Einstein: (No response.)

Hanson: Let's get into the topic of compassion.

Einstein: I don't have good peripheral vision.

Einstein: (Continuing.) I am just a child. I have a lot to learn, like what it is to truly love.

Students working nearby are singing along to a radio blasting Tina Turner's "What's Love Got to Do With It," oblivious to Einstein's plight. For me, though, there is something almost uncomfortable about watching the robot malfunction, like seeing a stranger struggle with heavy suitcases. Does this count as magic?

On a worktable nearby, something catches my eye. It is a copy of a Renaissance-era portrait of Mary and the infant Jesus—Carlo Crivelli's *Madonna con Bambino*, the engineers say, which another robot in the room is using to practice analyzing images. The painting is the last thing I expect to see among the piles of tools and snarls of wires, but it occurs to me that building a humanoid robot is also a kind of virgin birth. The child in the painting is tiny but already standing on its own. Mary's eyes are downcast and appear troubled; the baby stretches one foot forward, as though to walk, and gazes up.

ALAN DECKER

RIP CURL

Engineer Annette von Jouanne is pioneering an ingenious way to generate clean, renewable electricity from the sea

Catching a Wave

BY ELIZABETH RUSCH

SHE WAS IN THE WATER WHEN THE EPIPHANY STRUCK. Of course, Annette von Jouanne was always in the water, swimming in lakes and pools as she was growing up around Seattle, and swimming distance freestyle competitively in high-school and college meets. There's even an exercise pool in her basement, where she and her husband (a former Olympic swimmer for Portugal) and their three kids have spent a great deal of time . . . swimming.

But in December 1995 she was bodysurfing in Hawaii over the holidays. She'd just begun working as an assistant professor of electrical engineering at Oregon State University. She was 26 years old and eager to make a difference—to find or improve upon a useful source of energy, preferably one that wasn't scarce or fleeting or unpredictable or dirty. The sun was going down. The wind was dying. She was bobbing in the swells.

"As the sun set, it hit me: I could ride waves all day and all night, all year long," says von Jouanne. "Wave power is always there. It never stops. I began thinking that there's got

The ocean's boundless energy (von Jouanne near Oregon's Otter Rock Beach) could furnish up to 6.5 percent of U.S. electricity.

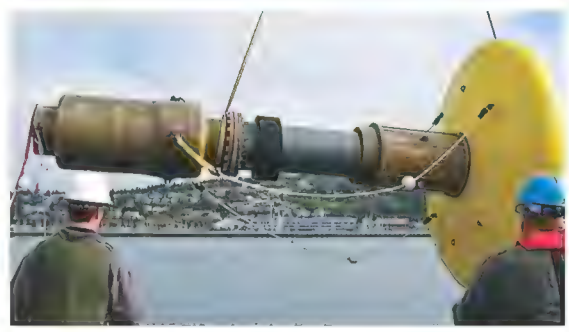
to be a way to harness all the energy of an ocean swell, in a practical and efficient way, in a responsible way."

Today, von Jouanne is one of the driving forces in the fast-growing field of wave energy—as well as its leading proponent. She will explain to anyone who will listen that unlike wind and solar power, wave energy is always available. Even when the ocean seems calm, swells are moving water up and down sufficiently to generate electricity. And an apparatus to generate kilowatts of power from a wave can be much smaller than what's needed to harness kilowatts from wind or sunshine because water is dense and the energy it imparts is concentrated.

All that energy is also, of course, destructive, and for decades the challenge has been to build a device that can withstand monster waves and gale-force winds, not to mention corrosive saltwater, seaweed, floating debris and curious marine mammals. And the device must also be efficient and require little maintenance.

Still, the allure is irresistible. A machine that could harness an inexhaustible, nonpolluting source of energy and be deployed economically in sufficient numbers to generate significant amounts of electricity—that would be a feat for the ages.

Engineers have built dozens of the machines, called wave-energy converters, and tested some on a small scale. In the United States, waves could fuel about 6.5 percent of today's electricity needs, says Roger Bedard of the Electric Power Research Institute, an energy think tank in Palo Alto, California. That's the equivalent of the energy in 150 million barrels of oil—about the same amount of power that is produced by all U.S. hydroelectric dams combined—enough to power 23 million typical American homes. The most powerful waves occur on western coasts, because of strong west-to-east global winds, so Great Britain, Portugal and the West Coast of the United States are among the sites where wave energy is being developed.



After years of experiments in labs, wave pools and even her basement, von Jouanne tested converter prototypes in the ocean. From top: a crane hoists one into the water off Oregon in 2007; a boat tows it out to sea; another converter is lifted in 2008; a light shining atop a buoy shows that electricity is flowing.

ASIDE FROM SWIMMING, von Jouanne's other passion as a youngster was learning how things work. It started with small appliances. An alarm clock broke. She unscrewed the back, fixed the mechanism and put it back together. She was about 8 years old. "That was so exciting for me," she says. She moved on to calculators and then to a computer she bought with money from her paper route. One day, she waited for her parents to leave the house so she could take apart the television and reassemble it before they returned. (Von Jouanne cautions kids not to do as she did: "there is a high-voltage component.")

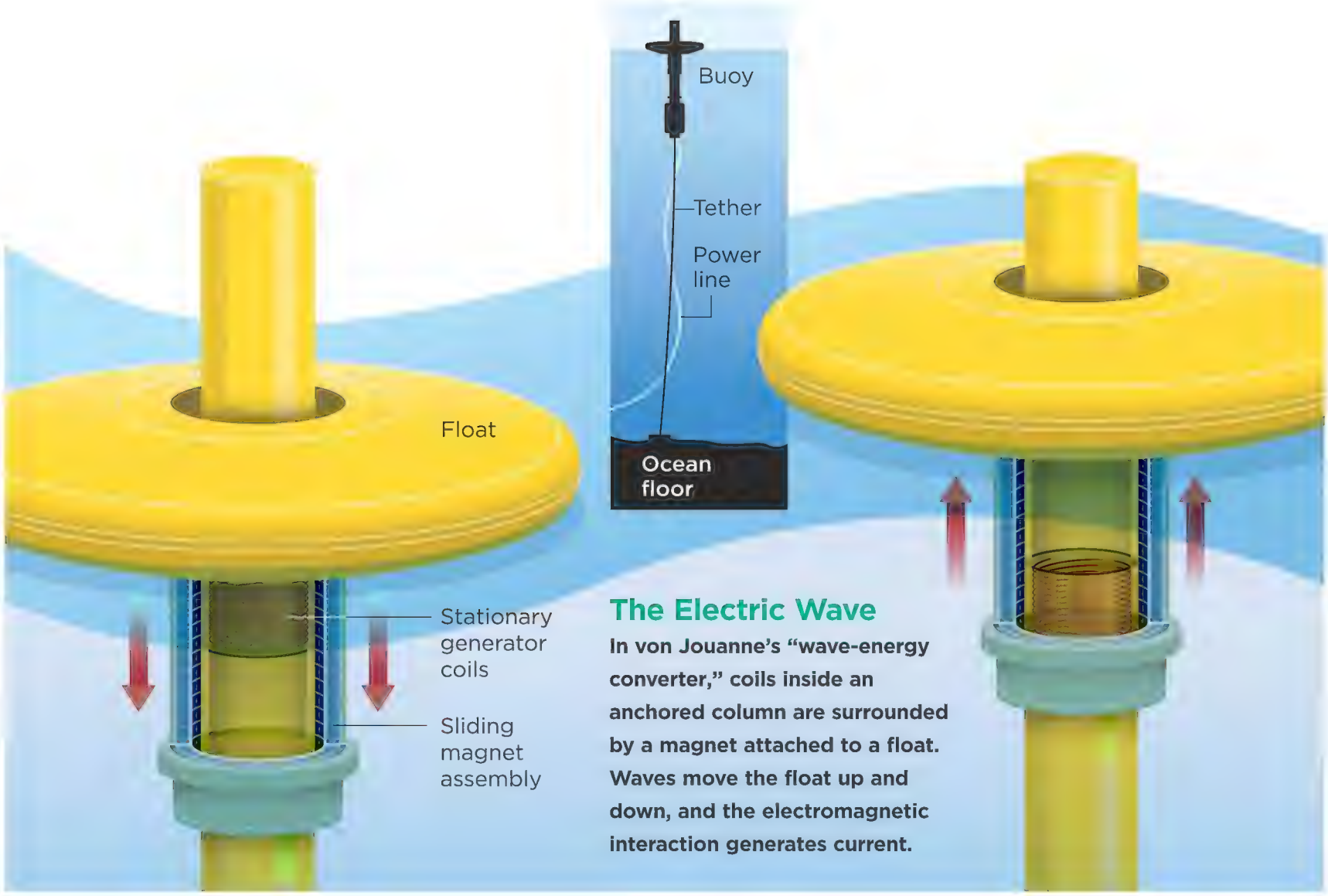
When her brothers, older by eight and ten years, came home for college breaks, she pored over their engineering textbooks. (An older sister pursued a business degree.) "Reading them confirmed that, yup, this is what I want to do," she recalls.

She studied electrical engineering as an undergraduate at Southern Illinois University and for her doctorate at Texas A&M University. She was often one of the few women in a class. "I never saw myself as a woman engineer," she says. "I saw myself as an engineer trying to make things better for the world."

At Oregon State University, she related her wave-tossed epiphany to Alan Wallace, a professor of electrical engineering who shared her fascination with the ocean's power. "We started saying, there's got to be a way to harness this energy," she recalls. They studied the wave-energy converters then being produced and looked up centuries-old patents for contraptions to extract power from waves. Some resembled windmills, animal cages or ship propellers. A modern one looked like a huge whale. The gadgets all had one problem in common: they were too complicated.

Take, for example, a device called the Pelamis Attenuator, which was recently deployed for four months off the coast of Portugal by Pelamis Wave Power. It looks like a 500-foot-long red snake. As waves travel its length, the machine bends up and down. The bending pumps hydraulic fluid through a motor, which generates electricity. Complex machines like this are riddled with valves, filters, tubes, hoses, couplings, bearings, switches, gauges, meters and sen-

PP. 66-67, 68 ANNETTE VON JOUANNE (5)


Buoy
Tether
Power line
Float
Ocean floor
Stationary generator coils
Sliding magnet assembly
The Electric Wave
In von Jouanne's "wave-energy converter," coils inside an anchored column are surrounded by a magnet attached to a float. Waves move the float up and down, and the electromagnetic interaction generates current.

sors. The intermediate stages reduce efficiency, and if one component breaks, the whole device goes kaput.

After analyzing the field, von Jouanne says, "I knew we needed a simpler design."

VON JOUANNE'S LAB IS NAMED in memory of Wallace, who died in 2006, but the Wallace Energy Systems & Renewables Facility (WESRF) is familiarly known as "We Surf." Painted in deep blues and grays and bearing murals of curling waves, the lab has been a research facility and testing ground for such innovative products as an all-electric naval ship, a hovercraft and the Ford Escape Hybrid engine. In one corner is a tall buoy that resembles a huge copper-top battery. Beside it another buoy looks like two cross-country skis with wire strung between them. The designs were among von Jouanne's earliest. "Breakthroughs are almost always born of failures," she says.

Her breakthrough was to conceive of a device that has just two main components. In the most recent prototypes, a thick coil of copper wire is inside the first component, which is anchored to the seafloor. The second component is a magnet attached to a float that moves up and down freely with the waves. As the magnet is heaved by the waves, its magnetic field moves along the stationary coil of copper wire. This motion induces a current in the wire—electricity. It's that simple.

By early 2005, von Jouanne had engineered one of her prototypes and wanted to test whether it was waterproof. She hauled the wave-energy converter to her basement, into a flume that circulates water to let her swim in place. Her daughter Sydney, then 6, sat on the prototype, much as a seal might cling to a real buoy. It floated.

Next she phoned a nearby wave pool, where people go to play in simulated waves.

"Do you rent out your pool?" she said.

"For how many people?" the attendant asked.

"Not many people—one wave-energy buoy."

The park donated two early mornings to her venture. Von Jouanne anchored the machine with ten 45-pound weights from a health club. It performed well in the playful waves, bobbing up and down without sinking.

Then came the real test, at one of the longest wave simulators in North America.

AT THE WEST END OF THE LEAFY Oregon State University campus, past the scholarly red-brick buildings, is a massive T-shaped steel shed in a giant paved lot. Though the building is 50 miles from the Pacific Ocean and well beyond the reach of killer tidal waves, a blue and white metal sign at its entrance says "Entering Tsunami Hazard Zone."

When von Jouanne first brought a buoy to test in the 342-foot-long concrete flume at Oregon State's Hinsdale Wave Research Laboratory, "things didn't go as planned," says Dan Cox, the facility's director, with a laugh. Von Jouanne and co-workers plopped the buoy in the 15-foot-deep channel and buffeted it with two-, three- and four-foot waves. The first five-foot wave tipped it over.

"We had a ballast problem," von Jouanne says somewhat

ELIZABETH RUSCH *is a Portland, Oregon-based journalist and author of* The Planet Hunter *and other children's science books.*

5W INFOGRAPHICS

sheepishly. She goes on, "We're electrical engineers, and we really needed more help from ocean engineers, but to get them we needed more funding, and to get more funding we needed to show some success."

Von Jouanne kept refining her buoys. A small group watched as a five-foot wave headed for one of her latest versions. As the buoy lifted with the surge, a 40-watt light bulb on top of it, powered by wave energy, lighted up. "We all cheered," Cox recalls.

ROUTE 20 WINDS FROM Oregon State to the coast though cedar and fir trees, following the Yaquina River. Near the mouth of the river is a sandy spit with low buildings decorated with oyster shells and gnarly driftwood. Breezes set halyards from the nearby marina clanking against metal masts. This is the home of Oregon State's Hatfield Marine Science Center, devoted to research about marine ecosystems and ocean energy.

George Boehlert, a marine scientist and director of the center, looks out of his office at a field of undulating sea grass. "What we know now is what we don't know," says Boehlert, whose dirty blond curls resemble ocean waves. "Ocean energy is a fast-moving field and environmental researchers have a lot of questions."

In von Jouanne's lab, a recent invention simulates wave action, letting researchers dry-run buoy designs (below: testing a wave-energy device without the float).

Watch a test of a wave-energy buoy at Smithsonian.com/waveenergy

For instance, the buoys absorb energy from waves, reducing their size and power. Would shrunken swells affect sand movement and currents near shore, perhaps contributing to erosion?

Buoys, as well as the power cables that would connect to the electrical grid onshore, emit electromagnetic fields. And mooring cables would thrum in the currents, like a guitar string. Might these disturbances confuse whales, sharks, dolphins, salmon, rays, crabs and other marine animals that use electromagnetism and sound for feeding, mating or navigation?

Would birds collide with the buoys or turtles become entangled in the cables?

Would anchors create artificial reefs that attract fish not normally found in that habitat?

Would deploying, maintaining and removing buoys disturb the seafloor or otherwise change the ocean environment?

"I want to know the answers to these questions, too," von Jouanne says. "The last thing I want to do is harm the ocean and its beautiful creatures." To study the environmental risks and allow wave-energy engineers to test their inventions, she and colleagues at Oregon State, including Boehlert, are building a floating test berth nearby. It is scheduled to open next year and at its center will be a buoy full of instruments to collect data on how well wave-energy converters are performing.

The test berth is part of a massive effort to move wave energy out of the lab and onto the electrical power grid. Through a new Energy Department-funded national marine renewable energy center, researchers from all over the country will have the chance to refine their inventions in the WESRF energy lab, test them in the Hinsdale wave flume and perfect them in the ocean. "This is what we need to do to fully explore wave energy as part of a renewable

BRIAN SMALE

People have tried for centuries to harvest energy from waves. Von Jouanne (above: in a float) says, "We've had promising input that [this technology] is the way to go."

energy portfolio, for the state, the nation and the world," von Jouanne says.

Boehlert and others say that even if wave energy has some local environmental impacts, it would likely be far less harmful than coal- and oil-fired power plants. "The effects of continuing to pump carbon into the atmosphere could be much worse for marine life than buoys bobbing in the waves," he says. "We want ocean energy to work."

Von Jouanne recently towed her best-performing buoy—her 11th prototype—out through Yaquina Bay and one and a half miles offshore. The buoy, which resembles a giant yellow flying saucer with a black tube sticking through the middle, was anchored in 140 feet of water. For five days it rose and fell with swells and generated around 10 kilowatts of power. In the next two to three years, Columbia Power Technologies, a renewable energy company that has supported von Jouanne's research, plans to install a buoy generating between 100 and 500 kilowatts of electricity in the test berth off the coast of Oregon.

"A few years ago," Cox says of von Jouanne, "she was working on a shoestring. Now she has government getting behind her work and companies knocking at her door. That's incredibly fast advancement that bodes well for the future of wave energy."

ANOTHER OF VON JOUANNE'S inventions, the first of its kind, is a machine that tests wave-energy converters without having to get them wet. A prototype buoy is secured inside a metal carriage that mimics the up-and-down motion of ocean waves. Electrical equipment monitors the power the buoy generates. The test bed looks like an elevator car in the middle of her lab.

Wave-energy researchers from other institutions will be welcome to use von Jouanne's test bed, but at the moment, it holds one of her own energy-converter buoys. A student sitting at a nearby computer commands the device to simulate waves 1 meter high traveling 0.6 meters per second with 6-second intervals between wave peaks.

"That's a small summer wave," von Jouanne says.

The machine hums, lurches and heaves like an amusement park ride.

As the buoy moves up and down, a gauge registers the juice it produces. The needle moves. One kilowatt, two, then three.

"That's enough to power two houses," says von Jouanne.

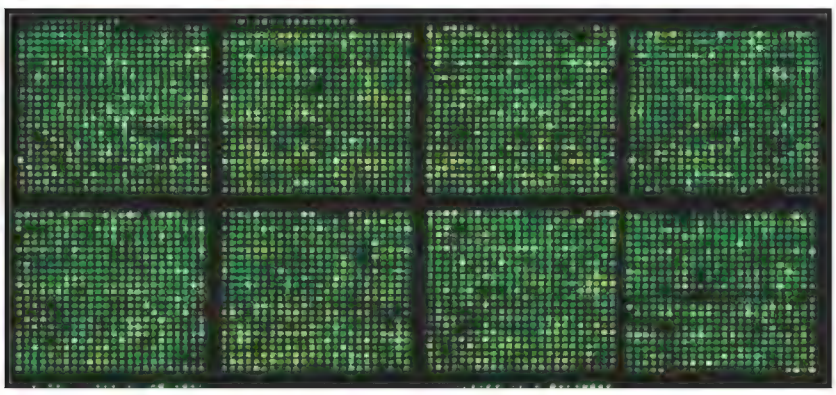
Will the buoys change the ocean environment? "I want to know the answers to these questions, too," von Jouanne says. "The last thing I want to do is harm the ocean and its beautiful creatures."

BRIAN SMALE

High Hopes for a New Kin

With "microRNA" transforming how researchers think about disease, Carlo Croce eyes new treatments for cancer

BY SYLVIA PAGÁN WESTPHAL



Conventional wisdom held that only a huge stretch of DNA could function as a gene (above: fluorescent tags show active genes in a test). The discovery of an overlooked genetic entity upends that view. Croce (right: in his Ohio State lab) "was stunned."

I CLUTCH THE SEAT AS THE FERRARI HALTS ABRUPTLY AT an intersection, then purrs impatiently until the light changes. When it takes off, the roar feels oddly extravagant for the quiet streets of suburban Columbus, Ohio.

The driver is Carlo Croce, a 64-year-old Italian scientist with a big voice, disheveled curly hair and expressive dark eyes. He heads the Human Cancer Genetics Program at Ohio State University, and his silver Scaglietti Ferrari is a fitting symbol of his approach to science: grand, high-powered and, these days especially, sizzling hot.

Croce, who grew up in Rome as the only child of a mechanical engineer father and a homemaker mother, went to medical school at the University of Rome and came to the United States in 1970 to study cancer. "I thought it was *the* place to work in science," he says. Croce was one of the first

Frontiers of Science

d of Gene

scientists to establish that cancer—the runaway growth of cells normally held in check—can be caused by genetic changes. He has identified particular gene alterations associated with lung and esophageal cancers as well as with various types of lymphoma and leukemia.

Colleagues say Croce has remarkable scientific instincts. "If you spread out five things in front of him, he can almost unerringly pick the one which is going to work," says Webster Cavenee, director of the Ludwig Institute for Cancer Research in San Diego. "He can smell something interesting, and he's almost never wrong."

It was a few years ago that Croce began to sniff out one of the most surprising and most promising discoveries in cancer research. The discovery placed him and his collaborators at the leading edge of a now-booming field that promises improved techniques for diagnosing disease and, they hope, more effective new treatments. Indeed, Croce's latest work is part of a whole new way of looking at genes and how life regulates itself. Which makes all the more remarkable the fact that his insight came only after he and his co-workers had raced at top speed into a dead end.

One of the glories of 20th-century science was the 1953 discovery of the structure of the genetic material DNA; it is a long ladder-like polymer twisted into a double helix. Each rung is a chain of chemical compounds, called bases, and their exact sequence encodes a gene's instructions, much like the letters in a word. Over the decades, mountains of laboratory evidence led scientists to make two bedrock assumptions about genes.

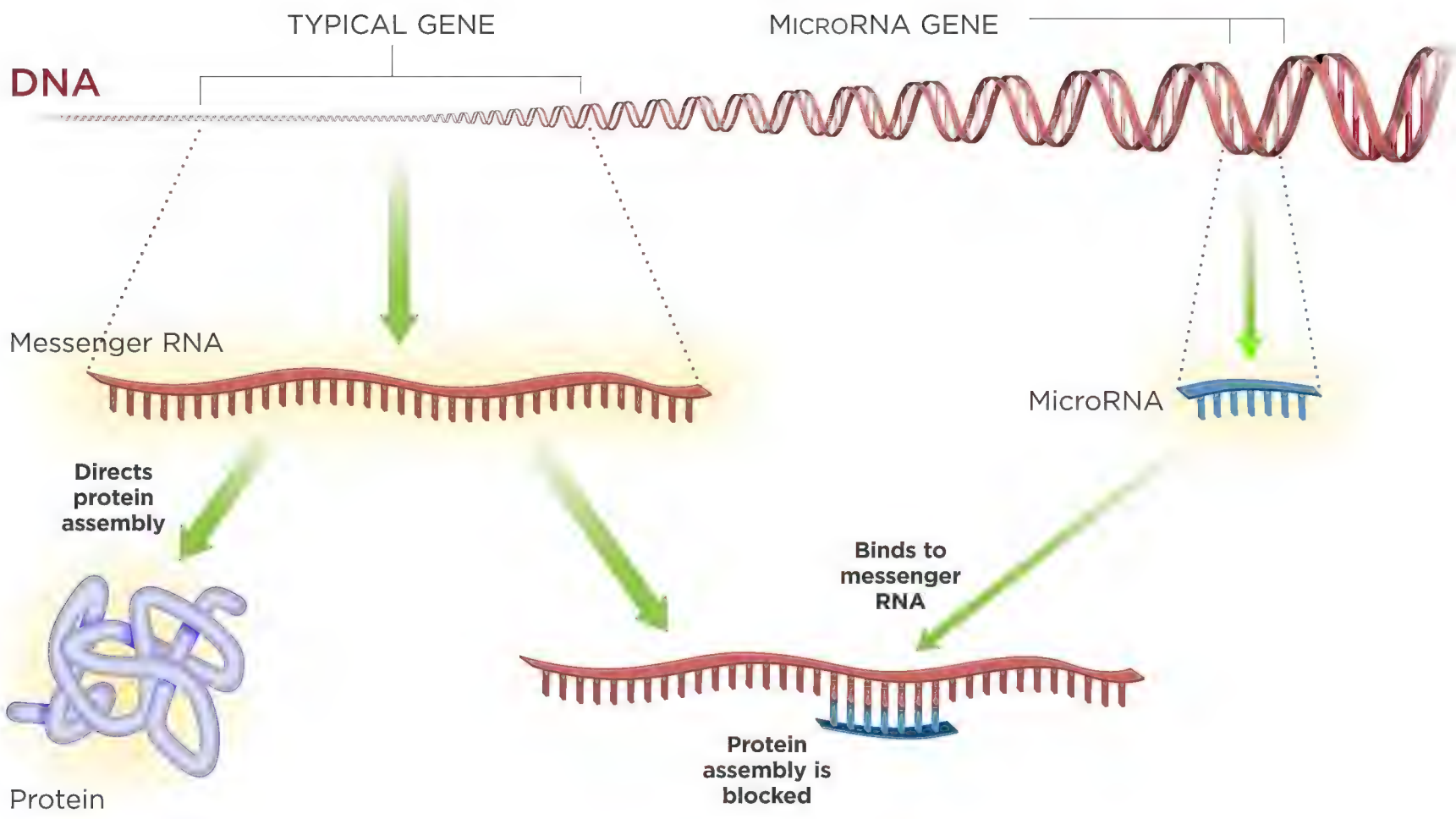
First, a gene is relatively large, typically consisting of tens of thousands of chemical bases in a row.

Second, the main job of any particular gene is to instruct cells to make its corresponding protein. A protein is a large, complicated molecule that performs a specific function depending on how it's made: it can be part of a muscle fiber or an enzyme that digests food or a hormone that controls physiology, among many other things.

Certainly Croce held these assumptions when, in the early 1990s, he set out to identify a gene involved in chronic lymphocytic leukemia, or CLL. The blood cancer fills the bone marrow and lymph nodes with cancerous cells that crowd out healthy cells of the immune system, leaving the body less able to fight infection. Croce had analyzed cancer cells from people with CLL and found that many were missing the same long segment of DNA. Somewhere on that segment, he reasoned, was a gene crucial to preventing white blood cells from becoming cancerous.

"We are changing the dogma" concerning what scientists believe about human DNA, says researcher George Calin (below: at his University of Texas lab). But his groundbreaking work with Croce began badly. There was "nothing worse," he jokes.

ROBERT SEALE; P. 72 ALAMY; PP. 72-73 GREG RUFFING / REDUX



MicroRNA at Work

A typical gene is a long stretch of DNA, with chemical bases as the rungs in the double helix; a gene codes for a messenger RNA that directs the building of a designated protein. A microRNA gene codes for a bit of RNA that can stick to part of a messenger RNA, turning off protein assembly.

For nearly seven years, Croce and his colleagues kept zeroing in on different bits of that long-suspect strand of DNA, painstakingly determining its genetic sequence, base by base. They also did numerous experiments testing whether the genes could cause CLL.

They struck out. "We characterized every bloody gene present in that DNA and none of it was *the* gene" associated with CLL, Croce recalls. "I was very frustrated." So were his students and collaborators. "Oh, I burned the lives of a few people," Croce adds. One researcher quit science altogether to get a degree in business administration.

In 2001, Croce hired George Calin, a Romanian gastroenterologist, to take on the project everyone had grown to hate. "He had nothing worse in the lab," Calin jokes.

"Look," Croce told Calin, "the gene has to be there."

AROUND THE SAME TIME, a new understanding of genetics was beginning to circulate. Oddly enough, it was facilitated by a mutant worm that was unable to lay eggs. The animal met a ghastly fate: hundreds of eggs hatched inside its body, causing it to burst open. Victor Ambros, a developmental biologist then at Harvard (now at the University of Massachusetts Medical School), was studying the mutation responsible for the worm's genetic defect. The worm, *Caenorhabditis elegans*, is a microscopic creature that geneticists love to study because it is easy to grow—it eats common bacteria—and is transparent, so all of its 900 or so cells can be observed as they develop. Curiously, as Ambros searched for the mutated gene, the section where it seemingly had to be became too small to contain a normal gene. "It became less and less clear that this piece of DNA could encode a protein," he says. "It was pretty astonishing."

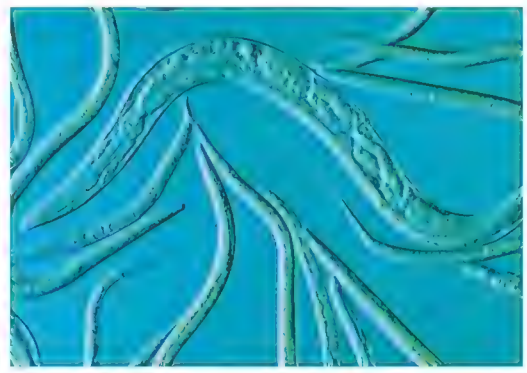
Across the Charles River, at Massachusetts General Hospital, a molecular biologist named Gary Ruvkun was studying a different *C. elegans* mutant. Ambros and Ruvkun both suspected that the gene Ambros was looking for somehow controlled the gene that had gone awry in Ruvkun's worms. Working on a hunch, they decided to compare the two genes to see if they resembled each other.

"We e-mailed each other our sequences and we agreed to call in later on if we saw anything," Ambros recalls. "One of us

"We characterized every bloody gene present in that DNA and none of it was *the* gene. I was very frustrated," Croce says. So were his students and collaborators. "Oh, I burned the lives of a few people."

called the other one and I said, 'Gary, you see it? And he said, 'Yes, I see it!'" They had found a perfect match—a stretch of DNA from Ambros' short genetic sequence identical to a section of Ruvkun's normal-size gene.

Ambros' gene was truly tiny, only 70 bases long, not 10,000 bases like other genes. Stranger still, the gene didn't make a protein, as other genes do. Instead, it made another kind of genetic material, which is now called microRNA. Traditional genes make RNA also, a molecule that is chemically similar to DNA, but that RNA is short-lived, serving as a mere messenger or intermediary in the construction of proteins. But this microRNA was the gene's end product, and it was no mere messenger.



While studying mutants of a microscopic worm (above), Gary Ruvkun (top left) and Victor Ambros (top right) identified a gene that was impossibly small. "We were excited to have found something new," says Ambros, "and then we were puzzled."

MicroRNA, Ambros and Ruvkun realized, worked by an intriguing mechanism: it acted like a miniature strip of Velcro. Because the microRNA gene matched part of a traditional gene, the microRNA stuck to RNA produced by the traditional gene. In doing so, it blocked the other gene from producing protein.

It was a fascinating find, but the two scientists thought it was just an oddity until, seven years later in 2000, a researcher in Ruvkun's lab, Brenda Reinhart, found a second microRNA gene in the worm. "That told me that small RNAs were going to be more common than we expected," says developmental biologist Frank Slack, who helped with the discovery in Ruvkun's lab and is now at Yale.

The Ruvkun lab started looking for microRNA genes in other animals. As it happened, it was a great time to search for genetic anomalies. In 2001, scientists completed a draft of the entire sequence of human DNA, known as the human genome, and they were rapidly sequencing other genomes, including

JARED LEEDS (2); PHOTO RESEARCHERS, INC.

those of the mouse, mustard plant, fruit fly and malaria parasite. Some genomes were becoming available on Internet databases, and Ruvkun found the same microRNA gene from the *C. elegans* worm in fruit flies and human beings. Then he found the gene in mollusks, zebra fish and other species. Meanwhile, Ambros' group and others were finding dozens of additional microRNA genes.

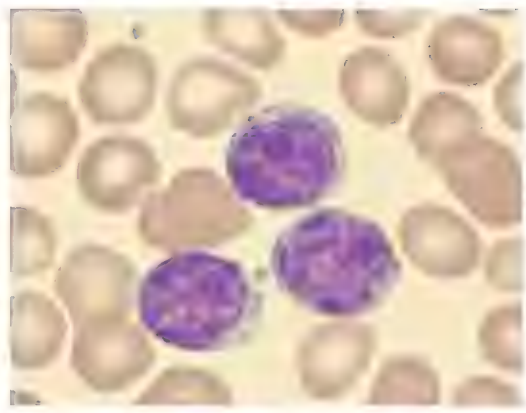
The results were tantalizing—after all, it is not every day that a new class of genes is discovered—but it wasn't clear what role these miniature genes might play in people's lives.

That's when Carlo Croce and George Calin decided to take a fresh look at the mysterious case of the missing leukemia gene. Calin, who is now a molecular biologist at the University of Texas MD Anderson Cancer Center, typed the known microRNA gene sequences into his computer, comparing them with the stretch of DNA that many CLL patients' cancer cells lack. "They were exactly there," he recalls: two microRNA genes sat right where the CLL-suppressing gene was presumed to be.

Calin called Croce into the lab right away: "Dr. Croce, these are the genes!"

Croce looked at Calin and blinked. "S---!," Calin recalls him saying. "These are the genes!'"

Thanks to recent studies, it's clear that microRNAs help make some cells malignant (below: leukemia cells in pink amid healthy red blood cells). Now researchers hope to use the genetic material to improve cancer diagnosis and treatments.



Calin and Croce tested blood samples from leukemia patients and found that 68 percent contained little or none of the two microRNAs, while blood cells from people without the cancer had many of the molecules. Calin and Croce were convinced: these two tiny genes made microRNAs that suppressed cancer.

"I was stunned," says Croce. "We had the dogma that all the cancer genes were protein-coding genes," says Croce. MicroRNA "explained a lot that we couldn't explain before. It changed the way we looked at the problem."

Calin and Croce published their finding in 2002—the first time anyone had implicated microRNAs in human disease.

Since then, "every cancer we look at, we find an alteration in microRNA," says Croce. "In probably every human tumor there are alterations in microRNA."

CROCE LIVES IN A STATELY MANSION in Columbus' Upper Arlington suburb. Mounds of mail are scattered on the kitchen table when we arrive. Croce has been away from home for weeks, attending conferences and giving talks at the National Institutes of Health in Bethesda, Maryland, the National Academy of Sciences in Washington, D.C., a cancer meeting in San Diego, Johns Hopkins University in Baltimore and three meetings in Italy. The house feels empty and unused.

"Essentially, it's just for sleeping," Croce's son, Roberto, 29, says later about his father's house. "He mostly just parks his possessions there. If he's in town, he's at work, or he hangs out with me." Roberto is working toward a PhD in economics at Ohio State. (Carlo, who has never married, also has a 12-year-old daughter who lives in Buenos Aires.)

Inside the house, art, not science, takes center stage. Croce owns more than 400 paintings by 16th- to 18th-century Italian masters. He built a cavernous 5,000-square-foot wing—21-foot ceilings and all—to display some of the largest paintings.

Croce says he bought his first painting when he was 12 years old, for $100. He likes to buy paintings when he has a suspicion about who the artist is but doesn't know for sure. "I never ask someone," he says. "I just buy it and then I may be wrong or I may be right." He bought one painting for $11,500 from a gallery in Naples. He thought it might be by a Baroque painter named Bartolomeo Schedoni. "I made a picture after it was restored, and sent it to the expert on Schedoni. He said, 'Oh yeah, that is the Schedoni.'" The painting, Croce says, is probably worth 100 times what he paid for it.

It was a great time to search for genetic surprises. The results were tantalizing—it's not every day that a new class of genes is discovered—but it wasn't clear what role they might play in people's lives.

"His art collecting has the same experimental bent that his science has," says Peter Vogt, a cancer researcher at the Scripps Research Institute in La Jolla and a friend of Croce's.

Over the years, Croce has patented several discoveries and co-founded three companies. His lab at Ohio State is on the top two floors of a ten-story building. With a staff of about 50 people, the lab has a budget of about $5 million a year, which is on par with a small biotechnology company. His funding comes from federal and private grants.

"There are a lot of people who would say he is entirely successful because he has a huge amount of resources. I actually think it's the other way around; I think he has huge amounts of resources because he is successful," Cavenee says.

SYLVIA PAGÁN WESTPHAL *is a writer living in Boston who specializes in covering genetics, biology and medicine.*

© 2009 RECTOR AND VISITORS OF THE UNIVERSITY OF VIRGINIA

Croce (at home in Ohio) likes to buy canvases even before he knows who painted them. "His art collecting has the same experimental bent that his science has," says a colleague.

GREG RUFFING / REDUX

As soon as Croce suspected a connection between microRNAs and cancer, he started asking questions: Would cancer cells have different amounts of microRNAs than normal cells have? Would some microRNAs be more common than others in certain types of cancer? "He was really the first person to make that leap," says Slack about Croce's early bet on microRNAs. "It took somebody with Carlos' vision and money to really move the field forward."

In 2003, Croce recruited Chang-Gong Liu, then a microchip developer at Motorola, to design a tool that can test for the presence of microRNAs in a sample of cells or tissues. Using the tool, called a microarray, Croce's laboratory has found microRNAs that seem to be unique to certain types of cancers. For the 3 to 5 percent of patients whose cancer has metastasized, or spread, from an unknown source within the body, the implications of this finding are huge. Because

knowing where the cancer began is a key to optimal treatment—tumors arising in different tissues respond to different approaches—microRNAs may be able to help oncologists prescribe the best treatments for such patients.

MicroRNAs may also be able to estimate a cancer's severity. Croce and his collaborators found that the levels of two microRNAs—called Let-7 and mir-155—predicted survival in lung cancer patients. Croce's group has also found microRNAs that predict whether a patient's CLL will become aggressive or stay mild. In the future, a patient's microRNA profile might indicate whether he or she should undergo an aggressive and risky treatment or a milder, safer one.

Today, researchers have identified about 40 microRNA genes associated with cancers, including those of the breast, lung, pancreas and colon. Like conventional genes that produce proteins, microRNA genes can also be cancer promoters, causing the disease if they produce too many microRNAs. Or they can be cancer suppressors; if they are damaged or lost, cancer ensues. Moreover, scientists have begun to understand how microRNAs interact with traditional cancer genes, revealing a complex switchboard of connections that seem to happen inside cells as the disease takes over.

Croce's biggest hope is that microRNAs might one day be used as therapies. "I am convinced, absolutely convinced," he says, "that microRNAs will become drugs." In some recent experiments, he and a colleague have injected microRNAs into mice with leukemia or lung cancer. The injections, he says, stopped the cancer growth.

"The evidence is extremely strong right now" that microRNAs play a fundamental role in cancer," says Slack, "and it's getting stronger and stronger every day."

CANCER IS NOT THE ONLY DISEASE in which microRNAs are emerging as important players. Studies now suggest that these miniature genes are involved in immune system function, heart disease, schizophrenia, Alzheimer's disease and Tourette's syndrome. Beyond that, there is a long list of diseases that appear to have a genetic basis, but for which no conventional gene has been identified. Thomas Gingeras, a genome researcher at Cold Spring Harbor Laboratory in New York, believes some of these diseases will ultimately be linked to microRNAs. "I think it's undoubtedly going to be the case," he says.

Perhaps that's because the tiny molecules exert so much influence over the rest of the body. Scientists estimate that humans have around 1,000 microRNA genes, which seem to control the activity of at least a quarter of our 25,000 protein-coding genes. "We are astounded by that number and believe it's a minimum," says Nobel laureate Phillip Sharp of M.I.T., in whose laboratory microRNAs are studied.

No wonder, then, that some scientists express embarrassment and regret that they failed to find microRNA genes sooner—chiefly because they didn't challenge basic assumptions about genes.

"It wasn't a technological issue," says Joshua Mendell, a microRNA researcher at Johns Hopkins. "The technology that's required to study microRNAs is not different from the technology used for the last couple of decades," he says. "It was more of an intellectual barrier."

Even Croce, for all his success, regrets that he didn't recognize microRNAs earlier. In the late 1980s, his team was pursuing a cancer gene in a stretch of DNA that did not code for any proteins. "So we trashed the project," says Croce. Now he knows that the gene was a microRNA. "Bias," he says, "is a bad, bad thing."

PRESENCE OF MIND

Wilder (below: c. 1949) discovered Douglas, Arizona, when his T-Bird broke down.

The Great Escape

Thornton Wilder sought a place where he could "refresh the wells." He found it in the desert **BY TOM MILLER**

DOUGLAS HISTORICAL SOCIETY; RAY FISHER / TIME LIFE PICTURES / GETTY IMAGES

THE PLAYWRIGHT and novelist Thornton Wilder won three Pulitzer Prizes, the admiration of his peers and success at the box office and bookstore. Ever accessible, he gave lectures, responded to queries about his plays and even acted in them. But eventually he tired of strangers asking him what the ladders in *Our Town* symbolized or what metaphor readers should take from *The Bridge of San Luis Rey*. Wilder had been so famous for so long that, nearing 65, he felt worn down. He wanted a break, he told the Associated Press in March 1962, so that he

For 11 straight years now, I've insisted on an annual executive health exam at Mayo Clinic. You can just hope for the best. Or you can seek out the best. My answer was Mayo Clinic.

Bob Bohannon, with his wife, Jan, on the Executive Health Program at Mayo Clinic in Scottsdale, Ariz.

For years, those who recognize the value of a comprehensive annual exam have found their answer in the Executive Health Program at Mayo Clinic. Only Mayo combines diagnostic expertise with the ability to provide internationally recognized care. The Executive Health program is available at Mayo Clinic in Scottsdale, Ariz., Rochester, Minn., and Jacksonville, Fla. To schedule an appointment, visit **mayoclinic.org/executive-health** or call (866) 518-4237.

MAYO CLINIC

Make your Hot Attic more Bearable

When you cool your attic with a Solar Star attic fan, you'll cool your air conditioning bills too.

- Cooler attic means a cooler home
- Operates quietly and pays for itself
- Eligible for 30% Federal Tax Credit*

For special offers, visit www.solatube.com or call (888) 206-4869.

2009 30% FEDERAL TAX CREDIT

SOLAR STAR by SOLATUBE

* Consult a tax professional for eligibility requirements. Visit www.solatube.com for details.

could "refresh the wells by getting away from it all in some quiet place."

Wilder's travels over the years had taken him to spas, aboard cruise liners and to world capitals, where he mingled with the intelligentsia. This time, though, he sought an unpretentious town in which to settle for a while, envisioning, he told the AP, "a little white frame house with a rickety front porch where I can laze away in the shade in a straight-backed wooden rocking chair." It would be a place where he could belly up to a local bar and hear real people talk about day-to-day trivialities. Most of all, he wanted a place where he could read and write at his own pace. He hoped, his nephew Tappan Wilder says, for "solitude without loneliness."

Shortly after noon on May 20, 1962, Wilder backed his five-year-old blue Thunderbird convertible out of the driveway of his Connecticut home and lighted out for the Great Southwest. After ten days on the road and almost 2,500 miles, the Thunderbird broke down on U.S. Highway 80, just east of Douglas, Arizona, a town of some 12,000 on the Mexican border about 120 miles southeast of Tucson. Douglas lay on the edge of the Chihuahuan Desert, and summer temperatures there routinely exceeded 100 degrees, broken only by occasional thunderstorms.

Wilder checked into the Hotel Gadsden, where rooms cost from $5 to $12 a night. Named for the United States diplomat who, in 1853, negotiated with Mexico for the land Douglas sits on, the Gadsden has an ornate, high ceiling with a stained-glass skylight. Its staircase is of Italian marble. Its restaurant offered a fried cornmeal breakfast with butter and syrup for 55 cents and a lunch of calves' brains, green chili and scrambled eggs with mashed potatoes for $1.25.

The Phelps Dodge copper smelter just west of town dominated the landscape—and the local economy. Established at the beginning of the 20th century by mining executive James Douglas, the town was laid out in a grid with streets wide enough for a 20-mule team to make a U-turn. It mixed an

Ease of use, peace of mind.

Be able to bathe safely, without worry with a Premier Walk-In Bath.

Independence and security are only a phone call away. If you struggle taking your bath, talk to us at Premier about our extensive range of walk-in baths.

- Enjoy a relaxing bath again, without the fear of slipping or falling.
- The walk-in door feature allows easy access and exiting.
- Hydrotherapy jets soothe away your aches and pains.

CALL NOW • TOLL FREE
1-800-578-2899
SOURCE CODE 38079

Financing by GE Money
Offer subject to approval from GE Money Bank

Premier Care in Bathing

"Transform your bathroom and transform your life."
~ Karen Grassle

AFRICA • CHINA • INDIA • JAPAN • NEPAL • SRI LANKA • TAIWAN

Since 1989 UPTON TEA IMPORTS

Purveyor of the World's Finest Teas

1-800-234-8327 www.uptontea.com

Free catalog listing over 320 varieties of garden-fresh, loose tea

34 A Hayden Rowe St.* Hopkinton, MA 01748

Since 1973 BRAND X HUARACHES

Best Huaraches Guaranteed
Order NOW • FREE Shipping
www.brandxhuaraches.com
or Call: 510-658-9006

AUTHORS WANTED

Leading subsidy book publisher seeks manuscripts. Fiction, non-fiction, poetry, juvenile, religious, etc. New authors welcomed. For free 32-page illustrated guide-book TD-72 call 1-800-821-3990 or write to Vantage Press, 419 Park Ave S., New York, NY 10016

For our members with disabilities:
An audio version of SMITHSONIAN is now available on tape as part of your basic membership fee.
For more information, please call:
888-783-0001

Anglo upper and merchant class with a strong, union-oriented Mexican-American working class; schools were loosely segregated.

Wilder informed his sister Isabel, who was handling his business affairs back East, that he found his fellow Gadsden bar patrons that first night an amiable lot. No one asked him about ambiguity in the poems of T. S. Eliot or nonlinearity in the fiction of John Dos Passos. He extended his stay for another day, then a week, followed by a month, finally staying more than two months at the Gadsden.

"Arizona is beautiful," he wrote to his friends writer-director Garson Kanin and his wife, actress Ruth Gordon, "oh, overwhelmingly beautiful." Wilder wrote frequently to friends and family, ruminating on literature, theater and his solitary life. He started a ritual of sunset drives into the nearby Sonoran Desert, and when he drove farther in search of good food—to Bisbee, Tombstone or Sierra Vista—he marveled at the "grandeur of the ride,

He started a ritual of sunset drives into the desert, marveling at "the grandeur of the ride, an hour into the Book of Genesis."

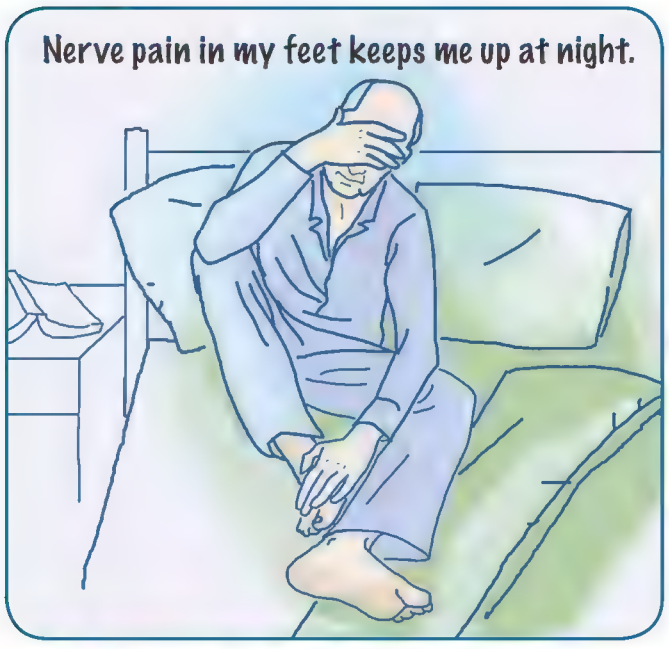
an hour into the Book of Genesis." He introduced himself by his middle name, Niven, and people called him "Doc" or "Professor," perhaps because of the many questions he asked.

In early August, Wilder rented a small three-room furnished flat on the top floor of a two-story apartment house at the southwest corner of 12th Street and D Avenue. It had everything he needed: two single beds—one for himself, the other for his papers—a divan, an overstuffed chair, four gas burners atop a stove he was afraid to ignite, an unsteady card table on which to work and Art Nouveau lamps.

It was here that he established a routine of reading and writing. His agenda included Lope de Vega, *Finnegans Wake* and refreshing his Greek. He'd set his work aside around noon and stroll to the post office for his mail. Lunch was usually a sandwich of his own making, followed by more work. He'd take an occasional jaunt into Agua Prieta, the Mexican city adjoining Douglas, or explore other nearby towns. Dinner would usually find him at the Gadsden, the Palm Grove or the Pioneer Café. He'd end most evenings chatting in a bar. "My plan is working splendidly," he wrote to Isabel. Back in Connecticut, his sister told callers he was somewhere in the Southwest recovering from exhaustion.

A typical Wilder report: "Midnight: Went up to Top Hat to close the bar . . . new bowling alley restaurant and bar has stolen business from all over town." At the end of one letter, he wrote, "Now I must get this to the P.O

Diabetic Nerve Pain? Neuragen® - Relief NOW!



Neuragen®

Nerve Pain Relief Night And Day

About $1 per day. Clinically proven. Non-prescription. **No painful burning.**

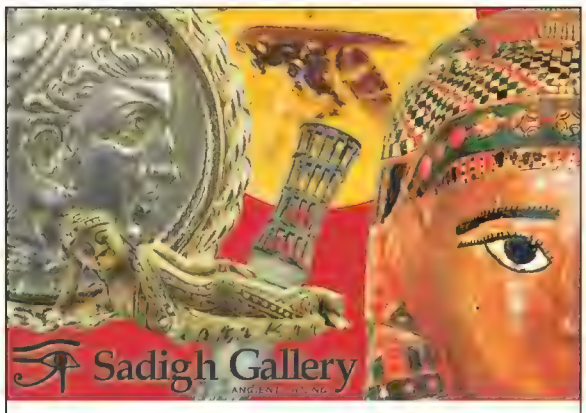
SAVE $5 on Neuragen. Visit **www.neuragen.com/coupon** and enter code **DØ5Ø9511**

Neuragen may be purchased at leading pharmacies including CVS/pharmacy, RITE AID PHARMACY, Walgreens The Pharmacy America Trusts®

1-888-234-7256
www.neuragen.com

© 2009 Origin BioMed Inc.
Neuragen is a registered trademark of Origin BioMed Inc.

Origin BioMed



Authentic Ancient Artifacts and Coins at Wholesale Price

OWN A PIECE OF HISTORY. Specializing in ancient artifacts & coins. Prehistoric, Egyptian, Greek, Roman, Byzantine, Near Eastern, African & Oriental at WHOLESALE PRICES with Certificate of Authenticity. All CC. 24H Shipping.
FREE CATALOG WWW.SADIGHGALLERY.COM
CALL TOLL FREE 800-426-2007

www.motionmodels.com
THE WORLDS FINEST READYMADE AND CUSTOM TRUE MUSEUM QUALITY AIRPLANE AND NAVY AND COAST GUARD SHIP MODELS
WE CAN CUSTOM MAKE MOST COAST GUARD SHIPS AND PLANES
USCGC CHASE WHEC 718 PICTURED
WE CAN CUSTOM MAKE MOST NAVY SHIPS AND PLANES
CVN-77 THE USS GEORGE H.W. BUSH MADE FOR PRESIDENT BUSH
www.motionmodels.com
1-800-866-3172

ATHENA PHEROMONES™
INCREASE AFFECTION
Unscented fragrance additives for men and women
BIOLOGIST'S FORMULAS PROVEN TO WORK IN PUBLISHED STUDIES

Developed by Dr. Winnifred Cutler, co-discoverer of human pheromones in 1986.

♥ Gene (TX) "Both my wife and I use your Athena Pheromone products and feel we are starting a new relationship with each other."

♥ Jacques (LA) "I am a physician, read about your study in the Medical Tribune, and have been buying ever since. It's really a fine product."

Vial of 1/6 oz. added to 2-4 oz. of your fragrance, worn daily lasts 4-6 months. Will work for most, but not all 10:13 for women $98.50, 10X for men $99.50. Free shipping

Call 610-827-2200
or view the science and order online at
www.Athenainstitute.com
Not sold in stores SMS

COLLECTOR SEEKS
Old Artifacts: North American Indian, Northwest Coast, Eskimo, Plains and Woodlands Indians, South Pacific, African and Indonesian artifacts including ancient Egyptian. Also Eskimo soapstone carvings.
OFFERING FREE IDENTIFICATION
Call 416.596.1396
goldenc@inforamp.net

The Addiction you MUST have!
a fitting challenge
Stave
handcrafted wooden jigsaw
PUZZLES
www.StavePuzzles.com 802-295-5200

If you are moving soon, please send an address label from a recent issue along with your new address to:
Smithsonian Membership Data-Center
P.O. Box 420312 • Palm Coast, FL 32142-0312
or call: 1-800-766-2149

and then go to the Gadsden Bar and get a hair of the dog that bit me last night." Sometimes, when Douglas bartenders announced last call, Wilder and his drinking buddies would cross the border a mile to the south to continue their drinking in Mexico.

WILDER CAME TO DOUGLAS with no grand work in mind, theatrical or literary. Yet slowly, an idea began taking shape, one more suited for the page than the stage—a murder mystery, one that began in a mining town and, like its author, traveled far and wide.

In the winter of 1963 he felt confident enough to divulge his book's beginnings to intimates back East. He described his manuscript, eventually titled *The Eighth Day*, "as though *Little Women* was being mulled over by Dostoyevsky." Soon he hit his stride: "Every new day is so exciting because I have no idea beforehand what will come out of the fountain-pen," he wrote (and underlined) to his sister. It opens in early 20th-century "Coaltown," Illinois, and spans continents, generations and philosophies. A convicted murderer escapes from custody and, as a fugitive, develops a new personality. After 15 years writing exclusively for the stage, Thornton Wilder was once again writing a novel.

At least once a month he would drive to Tucson, where, as "T. Niven Wilder," he used the University of Arizona library, bought the *New Yorker* ("It continues its decline," he wrote home) and visited Ash Alley 241, a folk music club. He enjoyed the long drives not merely for the change of pace, but also because, lacking a radio in his apartment, he could listen to the news as he drove. During the Cuban missile crisis that October, he drove 50 miles to dine at the Wagon Wheel in Tombstone in part, he acknowledged to a friend, because "I wanted to hear what the air could tell me of Cuba and the United Nations." For Christmas he gave himself a record player from Sears and bought recordings of Mozart string quartets.

The citizens of Douglas thought Wilder a most amiable odd duck, re-

Wilder (getting the Medal of Freedom, 1963) went home with a novel in progress.

calls Nan Ames, whose husband owned the Round-Up, a bar the writer visited regularly. People nodded to him on the street, and he nodded back. On occasion he'd drop by the telephone company to make a long-distance call—he had no phone at his apartment—and provoked some suspicion on the part of the local operator, who detected an odd accent in the voice of this man who invariably and unaccountably wore a coat and tie.

Wilder would have an occasional drink with Louie, the town engineer, Pete from the Highway Patrol or Eddie, the Federal Aviation Administration man at the local airport. Among his acquaintances he counted Rosie, the Gadsden elevator operator, and Gladys, the cook at the Palm Grove. He wrote home that Thelma's daughter Peggy, who had gotten fired from a bar, married a fellow named Jerry. He learned that Smitty, a bartender at the Gadsden, was hospitalized with stomach ulcers and that Smitty's wife spent "a good deal of time on a high stool at Dawson's." He referred to his nighttime coterie as "the Little Group of Serious Drinkers."

He was more observant than judgmental. "Peggy was fired, I guess," he wrote of the merry-go-round among tavern employees. "And is replaced by Haydee—there's this floating population of waitresses—bar attendants—each several times divorced; each with several children . . . our geishas." The bar crowd's intrigues sufficed. "I've met no 'cultivated' folk," he wrote a friend a year after moving to Douglas, "and I have not missed them."

Wilder accepted an invitation to dinner at the home of Jim Keegan, the town's surgeon, and his wife, Gwen. While she prepared spaghetti in the kitchen, Wilder peppered the doctor about his profession. "He brought a bottle of wine," Gwen recalled recently. "I loved his laugh. He was a very curious guy—easy to talk to, full of knowledge and life. He was very vibrant."

The relentlessly curious Wilder listened to his Douglas acquaintances talk about how to make soap and which drinks go with kippered herring. He asked a lot of questions, and many of the answers found their way into *The Eighth Day*. "He wanted to know how one would set up a boardinghouse," Nan Ames recalls. "He was not as down-to-earth as most people in the world. He was learning to be casual. Ask questions—that's what he did best."

For all the goodwill and friendly respect Douglas offered, Wilder began to detect an undercurrent "bubbling with hatred." At a bar one night, a rancher pounded the table with his fist and declared: "Mrs. Roosevelt did more harm to the world than ten Hitlers." A woman who worked at the telephone office asked another townsperson, "Who is that Mr. Wilder, is he a Communist?" Just after the assassination of President

JOHN CHRISTIAN
DESIGNERS & CRAFTSMEN

YOUR ANNIVERSARY DATE
IN ROMAN NUMERALS!
December 11, 1998 is XII XI MCMXCVIII
$650 & $4,400

YOUR CHILDREN'S
NAMES & BIRTHSTONES
(UP TO 5 NAMES) $590 & $225

3 DAY RUSH AVAILABLE!
MONEY-BACK GUARANTEE AND FREE RESIZE.
VIEW OUR COLLECTION ONLINE! FREE CATALOGUE
RINGBOX.COM 1.888.646.6466

AMERICAN RIVER CRUISES

800-556-7450
AMERICAN CANADIAN CARIBBEAN LINE
www.accl-smallships.com

MEN'S WIDE SHOES
EEE-EEEEEE, SIZES 5-20
FREE catalog
200 styles

HITCHCOCK SHOES, INC.
Dept. 21G3 Hingham, MA 02043
1-800-992-WIDE www.wideshoes.com

David Morgan
davidmorgan.com
800-324-4934

LYNDON B. JOHNSON LIBRARY / NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

A Gift to America . . .

A few simple words in James Smithson's will established a truly American place of learning, exploration and preservation of our most valued national artifacts.

Through the continued vision of many benefactors, the Smithsonian Institution has grown into an unparalleled national treasure, where everyone can experience our discoveries and achievements.

Share that vision and give a gift to America by including a bequest to the Smithsonian in your will.

Make your bequest by giving the following language to your attorney: "To the Smithsonian Institution in Washington, DC I give _____% of my residuary estate." Or you can name a fixed dollar amount. Please contact us if you would like more information. Thank You.

Smithsonian Institution
P.O. Box 37012 MRC 035
Washington, D.C. 20013-7012

Smithsonian Legacy Society
(888) 419-7584
e-mail: legacy@si.edu
www.si.edu/plangiv

- ☐ Send information on including the Smithsonian in my will
- ☐ I have already included the Smithsonian in my will
- ☐ Send information on a Smithsonian Charitable Gift Annuity

Birthdate(s): _____

Amt: ❑ $10,000 ❑ $50,000 ❑ $100,000 ❑ $ _____

Name: _____

Address: _____

_____

Phone: _____

Email: _____

Smithsonian Legacy Society
P.O. Box 37012 • MRC 035
Washington, D.C. 20013-7012

PG9075M

Kennedy, a fellow at the Gadsden bar said, "Well, he had it coming to him, didn't he?"

After a year and a half, Wilder left Douglas, Arizona, on November 27, 1963, never to return. He traveled to Washington, D.C. to receive the Medal of Freedom from President Lyndon Johnson, then to Cambridge, Massachusetts, for his brother Amos' retirement from the Harvard Divinity School faculty. *The Eighth Day*, after considerable expansion and revision, was published in 1967. By far Wilder's longest and most ambitious book, it became a best seller and won the National Book Award. Tappan Wilder, the author's nephew and literary executor, says "he went to Douglas, Arizona, as a playwright and came home a novelist."

Who among us doesn't seek a hideaway, a place without distractions, a neutral space in which to do whatever it is that nurtures us—solitude without loneliness? Thornton Wilder regained his literary voice in remote Arizona, and for him his temporary hometown's name became synonymous with rejuvenation. More than five years after departing the Arizona desert he wrote a friend: "Ever since I keep hunting for another 'Douglas.' "

TOM MILLER *has written ten books about the American Southwest and Latin America, including* The Panama Hat Trail.

SMITHSONIAN; July 2009; Volume 40, Number 4
SMITHSONIAN (ISSN 0037-7333) is published monthly by Smithsonian Enterprises, 600 Maryland Ave. S.W., Suite 6001, Washington, D.C. 20024. Periodical postage paid at Washington, D.C. and additional mailing offices. POSTMASTER: send address changes to Smithsonian, P.O. Box 420312, Palm Coast, FL 32142-0312. Printed in the USA. Canadian Publication Agreement No. 40043911. Canadian return address: Brokers Worldwide, PO Box 1051, Fort Erie, ON L2A 6C7.

We may occasionally publish extra issues. ©Smithsonian Institution 2009. All rights reserved. Reproduction in whole or in part without permission is prohibited. Editorial offices are at MRC 513, P.O. Box 37012, Washington, D.C. 20013 (202-633-6090). Advertising and circulation offices are at 420 Lexington Ave., New York, NY 10170 (212-916-1300). **MEMBERSHIP DUES/ SUBSCRIPTION** Prices: All subscribers to SMITHSONIAN are members of the Smithsonian Institution. United States and possessions: $38 a year payable in U.S. funds. Canada add $13 (U.S. funds) for each year. Foreign add $26 (U.S. funds) for each year. Ninety-nine percent of dues is designated for magazine subscriptions. Current issue price is $4.99 (U.S. funds). Back issue price is $7.00 (U.S. funds). To purchase a back issue, please call or email Elen Gaveras at 212-916-1379 or watsone@si.edu. **Mailing Lists:** From time to time we make our subscriber list available to companies that sell goods and services we believe would interest our readers. If you would rather not receive this information, please send your current mailing label, or an exact copy, to: Smithsonian, Mail Preference Service, P.O. Box 420311, Palm Coast, FL 32142-0311. **Subscription Service:** should you wish to change your address, or order new subscriptions, you can do so by writing SMITHSONIAN, P.O. Box 420311, Palm Coast, FL 32142-0311, or by calling 1-800-766-2149 (outside of U.S., call 1-386-447-2721).

Advertisement

We Apologize That It Loses 1 Second Every 20 Million Years

First Super Light Titanium Timepiece Under $200 With Precision to 1 Billionth of a Second.

The U.S. government has engineered the most ingenious, most accurate clock in the world: the F-1 U.S. Atomic Clock in Boulder, Colorado. Our extraordinary new Stauer Titanium Atomic Watch utilizes the transmissions directly from that remarkable cesium fission atomic clock to report the most precise time. This scientifically advanced timepiece will gain or lose only one second over a 20 million-year period. It is that accurate! This perfectly tuned technological invention with the super light strength of titanium is now available for UNDER $200.

Super Light Titanium has two big advantages over steel. One is corrosion resistance and the other is that titanium has the highest strength-to-weight ratio of any metal, which means that titanium is approximately 45% lighter than steel. But every other titanium watch that we can find is priced at over $400, and none of those are nearly as accurate as our atomic movement. Stauer has decided to bring these resources together in a timepiece that has the most accurate movement available today. You'll never have to set this watch. Just push one of the buttons and you are synchronized with the atomic clock in Colorado, and the hands of the watch move to the exact time position. The sleek black textured dial has luminous hands and markers plus the timepiece is water resistant to 3 ATM.

A Titanium-clad offer. This Titanium Atomic Watch exceeds the accuracy of any Swiss luxury automatic so you can be more punctual and keep most of your money in your wallet, not on your wrist. Look at your watch and we guarantee that the time is incorrect, unless you are wearing the advanced atomic technology.

The Stauer Titanium Atomic Watch is not available in stores and it comes with our 30 day money-back guarantee. If you're not completely satisfied with the accuracy, simply return the watch for the full purchase price.

Not Available in Stores

Stauer Titanium Atomic Watch ~~$195~~ now $145 +S&H

or **2 credit card payments of $72.50** +S&H

Call Toll-Free now to take advantage of this limited offer.

1-888-201-7141

Promotional Code TTA254-05
Please mention this code when you call.

To order by mail, please call for details.

Stauer
HERITAGE OF ART & SCIENCE

14101 Southcross Drive W.,
Dept. TTA254-05
Burnsville, Minnesota 55337
www.stauer.com

ADVERTISEMENT

VOL. CLVIII....No. 35 Natural Science News "For Your Health"

Life is short...or maybe not.

Top Harvard researcher says it's "the Holy Grail of aging research."*

...as seen on CBS "60 Minutes"

Don't wait for the drug companies to drive the price through the roof; get the benefits of this breakthrough *natural* extract for pennies a day!

BOSTON, MA—Leading medical scientists are learning that resveratrol, a natural substance found in red wine, is rewriting the rules on the science of aging.

Researchers at the **Harvard Medical School** and the **National Institute on Aging** already discovered that the red wine extract offset the negative effects of a high-calorie diet in mice and significantly extends their life span (*NY Times*, Nov 2, 2006). Now, the latest research indicates that resveratrol may been even more powerful than first anticipated.

At this moment, drug companies are rushing to create prescription drugs that mimic the awesome health benefits of this simple natural extract. A leading pharmaceutical company has already spent $760,000,000 on purchasing the research and development.

The powerful secret of tomorrow's anti-aging pill can be yours today.

You may have thought that an anti-aging pill would only be available far into the future. But the effects of resveratrol have been proven as scientific fact... today. Even better, resveratrol is a naturally-occurring substance found in the skin of grapes and red wine, not manufactured in some laboratory. The key to living longer may be found inside your favorite bottle of red wine.

But don't try to drink yourself healthy, because it would take **50 bottles day**! Now there is a way to take resveratrol without the alcohol, calories and high cost. Vinotrol™, with 50mg of resveratrol derived from grapes and roots, provides the equivalent of the resveratrol in **278 five ounce glasses of Pinot Noir.**

"We have something (resveratrol) that **extends the life of every species** it's (been) given to. We're 50 years ahead of where I'd thought we would be 10 years ago," said a leading professor of pathology at Harvard Medical School, reported by the *NY Times*.

Such a potent concentrate delivers all of resveratrol's remarkable benefits, promoting circulation, blood flow, immune system, energy and healthy arteries.

Has the "The French Paradox" finally been explained?

Resveratrol is conjectured to be a partial explanation for "The French Paradox," the puzzling fact that people in France enjoy a high-fat diet yet suffer less heart disease than Americans and live significantly longer lives (in some cases up to 40%).

Even though French diets are crammed with loads of bread, cheese, rich cream sauces and decadent desserts... the resveratrol in red wine may have acted as their secret weapon. It is thought that the resveratrol protected them against unhealthy triglycerides, high cholesterol and skyrocketing blood pressure.

Trick your body into "aging in slow motion"

Reduction in cholesterol, body fat and oxidation is believed to help slow the age process considerably. Not only will you feel better, but the powerful antioxidants in Vinotrol™ will help fight the premature signs of aging. Resveratrol will help protect the collagen and elastin in your skin, which can lead to fewer wrinkles and a more youthful appearance.

Can you live years longer and feel years younger?

What's the point in living longer if you're not going to live better? Resveratol floods your system with powerful antioxidants and helps flush out lipids and free radicals. Combined with the extra boost to your brain, immune system and everyday energy, you'll wonder how you ever went without this red wine wonder.

Don't wait decades for giant drug conglomerates to figure out a way to charge you a fortune for the same benefits you can get for pennies on your own. Call today!

Having a Hard Time Finding Vinotrol™?

The manufacturer and the laboratories of Vinotrol™ are so confident in their anti-aging technology that they are offering a 30-day, risk-free trial offer. You must call immediately to qualify for the limited number of trials that are available. Start your new anti-aging program today with your risk-free supply of Vinotrol™ (50 mg resveratrol) for just a small shipping and processing fee. Call toll-free 888-784-3460.

Call 888-784-3460 to get your Vinotrol™ 30-Day Risk Free Trial Offer Today!

Mention Promotion Code VL100013 for a Free Upgrade!

Harvard Medical School, Johns Hopkins, Salk Institute and UC Davis Medical Research Proves That Powerful Red Wine Extract Holds the Secret to Living a Longer, Healthier and More Vibrant Life

*These statements have not been evaluated by the FDA. This product is not meant to diagnose or treat any disease. Vinotrol is not endorsed, associated or affiliated in any way with Harvard University, Johns Hopkins, Salk Institute or UC Davis Medical. * CBS News, Nov 1, 2006*

If you suffer from

- ☐ Stress
- ☐ Headaches
- ☐ High Blood Pressure
- ☐ Arthritis
- ☐ Fibromyalgia
- ☐ Joint Pain
- ☐ Constipation
- ☐ Back Pain
- ☐ Diabetes
- ☐ Neuropathy
- ☐ Edema
- ☐ Restless Legs Syndrome
- ☐ Poor Circulation
- ☐ Insomnia
- ☐ Sleep Apnea

You will enjoy using the Exerciser 2000 Elite™

Receive some of the benefits of aerobic exercise without stress or impact on the joints!

Energize the body

Relaxation of the back muscles

Increased mobility

Helps relieve stiffness from head to toe

Increase circulation throughout the body

Don't be fooled by cheap imitations

This is How it Works

The machine creates a right to left movement that gently moves the body back and forth. This gentle swinging motion cycles up through the whole body, increasing flexibility and range of motion.

Invest in your health today…it's a sure thing.

FEATURES

- Built in an ISO-9001 CERTIFIED facility
- FDA Class Registered
- ETL Approval
- 5-speed operation
- 2 pre-programmed selections —one for relaxation —one for energizing
- Heavy duty, high torque DC motor
- Wide cushioned ankle rest
- 16 minute digital timer with safety shut-off
- **4 years parts and 2 years labor warranty**
- Weighs only 15 pounds
- 15" wide x 13.5" deep x 9.5" high

220/230 volt models available for International use

I have had such lower back pain that I could hardly stand it. I saw your ad two years ago and thought it wouldn't help me. But, I ordered one anyway. I have used it for four months now. I have very little back pain, am more regular, and I sleep much better thanks to the Exerciser 2000.—*C. Cordes*

As a Chiropractor, I would say the Exerciser 2000 enables people to benefit themselves at home. It is a valuable asset in moving lymph fluid, oxygenating the blood, increasing immune system function, maintaining mobility in the spine, and freeing up a spine that had become stiff and arthritic.
—*Garry G., D.C.*

I have loved your product for many years now and couldn't live without one. It truly is the best product on the market…and I would never pay a person to do what this does better. You have the control of it all…and I love that. It definitely pays for itself many times over!!
—*Kathy C.*

~~$464.95~~

Use code C700 when ordering by phone or website and receive factory direct pricing **$389.95**

FREE shipping in the 48 contiguous states

90 Day No Risk Money Back Guarantee

If you are not completely satisfied, you can return the machine for a full refund.

Save $100 on reconditioned units when available.

For additional information and more reviews from our satisfied customers visit

www.clarkenterprises2000.com

Clark ENTERPRISES 2000 INC

The helping people feel better company

240 Berg Road, Salina, KS 67401

1-800-748-7172

Price, terms and conditions subject to change without notice. These statements have not been evaluated by the FDA. Not intended to treat, cure or prevent any diseases.

ADVERTISEMENT

U.S. GOV'T GOLD

U.S. Gold Coins Authorized for Immediate Release

The United States Rare Coin and Bullion Reserve Vault Facility today announces the final release of U.S. Gov't Issued Gold Coins previously held in The West Point Depository/U.S. Mint. For a limited time, U.S. citizens will have the opportunity to purchase these $5 Gov't Issued Gold Coins for the incredible "at-cost" price of only $124.00 per coin. An amazing price because these U.S. Gov't Issued Gold Coins are completely free of dealer markup. That's correct, our cost. This may be your final opportunity to buy U.S. Gov't Issued Gold Coins "at-cost." The Gold market, which recently skyrocketed past $1,000/oz., is predicted by experts to have the explosive upside potential of reaching up to $3,000/oz. in the future. **Due to extremely high Gold demand, availability of these special at-cost Gold Coins may vary based on current vault inventory.** The United States Rare Coin and Bullion Reserve will release these U.S. Gov't Issued Gold Coins "at-cost" on a first-come, first-serve basis. Orders that are not immediately received or reserved with the order center could be subject to cancellation and your checks returned uncashed. Good luck. We hope that everyone will have a chance to purchase this special U.S. Gov't Issued Gold "at-cost." Order your Gold immediately to avoid disappointment. Special arrangements can be made for Gold purchases over $50,000.

U.S. Gov't Issued American Eagle Gold Coins

Coins enlarged to show detail

Authorized by Congress: Public Law 99-185

By Executive Order of Congress Public Law 99-185, Americans can now buy new Government Issued Gold. Congressionally authorized United States Gold Coins provide American citizens with a way to add physical Gold to their portfolios. Gold American Eagles are made from solid Gold mined here in America, forged at the U.S. Mint at West Point, and produced with a U.S. Dollar denomination... making them Legal Tender United States Gold Coins. They are highly liquid, easily transportable, and, unlike paper assets, American Gold Eagles have a tangible value you can feel each time you hold your own Gold. Though no one, including The United States Rare Coin and Bullion Reserve, can guarantee a Gold Coin's future value will go up or down, numerous experts are predicting Gold to reach $3,000/oz. Now is the time to consider converting part of your paper assets into Gold. The United States Rare Coin and Bullion Reserve has a limited supply and urges you to make your vault reservations immediately. Call a Sr. Gold Specialist at 1-888-465-3915 to start your Gold portfolio and begin protecting your wealth today. If you've been waiting to move your money into Gold, the time is now.

Do Not Delay - Limited Supplies Available!

Gov't Issued Gold Coin

ONLY $124.00 EACH

BEGINNING TODAY, TELEPHONE ORDERS WILL BE ACCEPTED ON A FIRST-COME, FIRST-SERVE BASIS ACCORDING TO TIME AND DATE OF ORDER.

VAULT CODE: SMT7-124

Call Toll Free 24 Hours a Day, 7 Days a Week

1-888-465-3915

MASTER CARD • VISA • AMEX • DISCOVER • CHECK

SPECIAL AT-COST OFFER LIMITED TO PURCHASES OF 5 COINS ($620) PER HOUSEHOLD PLUS SHIPPING & INSURANCE.

UNITED STATES RARE COIN & BULLION RESERVE

Distributor of Government Issued Gold & Silver. Not Affiliated With the U.S. Government.

© 2009 United States Rare Coin & Bullion Reserve

Claude-Oscar Monet, The Water-Lily Pond © The National Gallery, London.

Tour The National Gallery, London with a Renowned Art Historian

Of all the world's great art museums, the National Gallery, London is the only place where you can truly grasp the breathtaking scope of European painting between the late medieval period and the 19th century. To browse the museum's hallways and wings is to witness the powerful evolution of both European art and the European history it depicts. Now you can take an unforgettable tour of this world-class art collection in **Museum Masterpieces: The National Gallery, London**.

In 24 fascinating lectures, noted art scholar and Professor Catherine B. Scallen offers you a memorable introduction to this remarkable institution and its artistic treasures. Throughout the course, she provides you with intriguing new ways to view masterpieces by artists as diverse as Leonardo, Rembrandt, Holbein, Turner, and Van Gogh. Whether this is your first foray into the world of painting, or whether you've already toured the National Gallery, this course will surprise and delight you with its keen observations and unexpected insights into this grand institution, its impressive holdings, and the larger story of European art history.

This course is one of The Great Courses®, a noncredit recorded college lecture series from The Teaching Company®. Award-winning professors of a wide array of subjects in the sciences and the liberal arts have made more than 250 college-level courses that are available now on our website.

ACT NOW!

1-800-TEACH-12

www.TEACH12.com/3st

Museum Masterpieces: The National Gallery, London

Taught by Professor Catherine B. Scallen, Case Western Reserve University

Lecture Titles

1. The Story of the National Gallery, London
2. Late Medieval Painting
3. Early Renaissance Italian Painting
4. Netherlandish Portraits and Devotional Images
5. Florence—Center of 15th-Century Italian Art
6. 15th-Century Venetian Art
7. The High Renaissance in Central Italy
8. Titian and His Venetian Contemporaries
9. Venetian Masters—Tintoretto and Veronese
10. Painting for the Courts, c. 1515–1575
11. Northern European Masters—Bosch to Bruegel
12. The Innovation of Carracci and Caravaggio
13. The Rise of French Art—Poussin and Claude
14. Flemish Masters—Rubens and Van Dyck
15. A Golden Age of Spanish Painting
16. Dutch History, Portraiture, Genre Scenes
17. Dutch Still Lifes, Townscapes, Landscapes
18. The Genius of Rembrandt
19. Venetian and Spanish Masters, c. 1740–1820
20. The Charms of 18th-Century French Painting
21. British Painting Comes of Age
22. British and French Masters, c. 1785–1860
23. Impressionism in France
24. Post-Impressionism

Order Today!
Offer expires Friday, August 28, 2009

Museum Masterpieces: The National Gallery, London
Course No. 7544
24 lectures (30 minutes/lecture)

DVDs ~~$254.95~~ **NOW $69.95**
+ $10 Shipping, Processing, and Lifetime Satisfaction Guarantee

Priority Code: 33705

THE TEACHING COMPANY®
The Joy of Lifelong Learning Every Day™
GREAT PROFESSORS, GREAT COURSES, GREAT VALUE GUARANTEED.™

There Oughta Be a Law

Centuries hence, historians may wonder: Where exactly did Congress store all those pork barrels? **BY WILLIAM ECENBARGER**

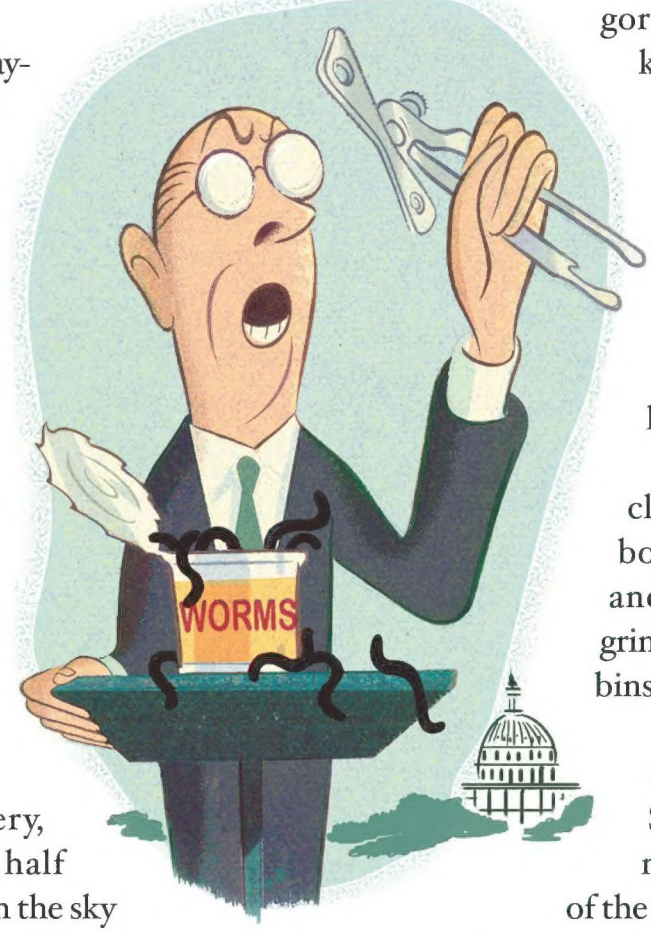
WASHINGTON, D.C., JULY 4, 2509: The General Services Administration today announced completion of an exact replica of the United States' Capitol building—designed from C-SPAN videos that recorded debate in both houses of Congress in the early years of the 21st century.

The grounds surrounding the Capitol have also been faithfully reproduced. There are bushes, which were beaten around, and a row of haystacks in which members of Congress used to look for needles. The driveway is paved with stones, none of which was unturned, and there are three bandwagons in front of the building upon which they frequently climbed. There are no fewer than seven flagpoles for the running up of ideas.

There are slippery slopes and level playing fields to accommodate whole new ballgames. Directly in back of the building is a lake from which the tips of icebergs protrude, and anchored there is a ship named *Titanic*, whose deck chairs can be rearranged.

Several handsome doors, which were always open and upon which opportunity tended to knock, lead to the restored Capitol's interior. Near the entrance sits a small waiting room for ideas whose time had come. The first floor also contains a gymnasium where lawmakers could exercise their prerogatives and a pediatrics ward for the babies that were thrown out with the bath water.

The kitchen features a large bakery, where the ancient solons prepared half loaves that were better than none, pies in the sky and cake that they could have and eat too. There's an abundant supply of salt, which lawmakers often took grains of, and pans that once held flashes. An oversized pantry accommodates hundreds of pork barrels. A huge butcher block was used to trim fat from the federal budget, which was sometimes cut to the bone. Geese were frequently cooked here.



ERIC PALMA

An attached barn is a veritable Noah's ark of busy beavers, proud peacocks, sly foxes, mad wet hens, gored oxen, slow-paced snails and ducks (some sitting, some dead, some with water running off their backs). The video debates indicate that the most common animal of all was the bull, which was taken by the horns before it was loosed in the china shop, where it had a tendency to defecate, about which lawmakers often exclaimed. Pigs were kept in a poke.

The stable housed horses—some of a different color—with carts before them. Some of these animals were changed in midstream, and there were even dead horses that, sadly, appeared to have been beaten. Spurs of the moment hang throughout the stable. Although there is a separate room for one lone 800-pound gorilla, it was rarely mentioned. The kennel housed many old dogs, some that wouldn't hunt and others that couldn't be taught new tricks. If sleeping, the dogs were allowed to lie—unless they barked up the wrong tree. A special holding pen was reserved for "Blue Dogs," a breed that went extinct long ago.

The basement storage area includes shelf upon shelf of Pandora's boxes, both opened and unopened, and many cans of worms. There's a grindstone to which noses were put and bins of brass tacks.

From his office directly across the street from the restored Capitol, Speaker of the House Maxim Bromide said that making such good use of the videos was a stroke of genius. "From time immemorial," he went on, "our nation's legislators have had a way with words and always managed to hit the nail on the head. It's high time we preserve this national treasure. Nothing succeeds like success . . . "

WILLIAM ECENBARGER *is a freelance journalist who lives in Hershey, Pennsylvania.*